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RAILWAY
MECHANICAL ENGINEER

Every Member of the Mechanical Department Challenged

We are in a war and the railroads are one of the most vital factors in a successful outcome

Last October, two months before our country became an active combatant in the World War, the *Railway Mechanical Engineer* pointed out the vital part that the railroads must take in increasing production in the United States, to make possible the success of those nations that were so desperately fighting the Axis powers. In modern mechanized warfare, the most essential factor is the ability to produce the vast amount of material which is required. American railroads could easily prove the bottleneck in this stupendous production effort. They have been and still are badly handicapped because of the lack of essential materials to enlarge their plants and equipment to meet the emergency. Obviously the mechanical department, that has charge of the construction, maintenance and repair of the equipment, is quite decidedly on the spot.

We must exercise our ingenuity to the limit and make a maximum use of the facilities and equipment at our disposal. Incidentally, not the least of our difficulties is the fact that so many of the workers in the mechanical department have been, and still are being drawn into the various fighting services. The necessity now is, of course, all the greater, since we are actively involved in the World War and our boys are already to be found on fighting fronts throughout the world.

In the effort to help the railroads make good, the *Railway Mechanical Engineer* last October announced a competition for articles on the ways and means of improving the mechanical department's operations or practices to increase production and secure a larger availability of the equipment. The returns from this competition greatly exceeded our expectations. We had intended to devote only part of this issue to them, but find ourselves so deluged with excellent material, that in spite of the fact that we have considerably enlarged this issue, as compared to normal ones, we still have considerable first-class material that will be run in the May number, or as quickly thereafter as possible.

We hope that the spirit of the competition will not die out with the publication of these articles. The men that have participated have taken the lead in a splendid forward movement. As you read their articles, however, you may see other ways in which production and efficiency may be increased, and which can be drawn to the attention of the railroad mechanical field to excellent advantage. Good as some of the suggestions are in this issue, some of you may already be using still better methods. We hope, therefore, that you will sit down immediately and advise us as to methods and practices that will be of special value at this time. The participants in the contest have done their part and we surely greatly appreciate it. It is up to the rest of you now to chip in your comment or contribution. In other words, the next move is up to you!

We should like to take this opportunity, also, of expressing cordial appreciation to many of our advertisers for adjusting their advertising copy to the objectives of this issue.

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The Story of the Contest

It was quite evident when the four mechanical conventions were held in Chicago late last September, that production of war materials and supplies would have to be speeded up greatly if this country, the Arsenal of Democracy, was to turn the tide in the World War and insure the defeat of the Axis powers. In spite of the fact that the railroads had not been able to secure the equipment which it was anticipated would be necessary to handle the peak load of the year, it was evident at that time that because of the fine spirit of co-operation on the part of the workers, managements and the shippers, they would squeeze over the peak without a shortage of equipment. At the same time it was recognized that there must be a still more intensive production in the months to follow, if this country was to make its influence felt at probably the most critical period in the world's history.

Because inadequacy of equipment promised to be the bottleneck so far as the railroads were concerned, the attendants at the meetings of the Railway Fuel and Traveling Engineers' Association, the Locomotive Maintenance Officers' Association, the Car Department Officers' Association and the Master Boiler Makers' Association, recognized that they were pretty much on the spot. It was recognized that everything possible must be done to secure a greater utilization of all of the equipment and facilities in charge of the mechanical department. During the closing hours of these conventions the editors of the *Railway Mechanical Engineer* made a broad survey of the situation and then decided to promote the contest, the results of which are reported in this issue.

It is doubtful if any other competition in our field has been so thoroughly promoted. The front page of the *Railway Mechanical Engineer* containing the convention reports first announced it. It was, of course, commented upon in succeeding issues. In addition to this, however, every railroad subscriber was written to. The co-operation of the heads of the mechanical departments was also requested, and as a result many of them secured additional copies of the announcement of the contest and saw to it that these reached people in their organizations that they thought might be interested. Employees' magazines of some of the railroads also helped to spread the news.

75 Contributions Received

The contest was announced to close on January 15. When the final returns were in there were 75 contributions, coming from 28 states and two Canadian provinces. They covered 62 cities in the United States and two in Canada. Literally, they came from railroad men from Ontario to Texas and from Maine to California. While it is impossible to use, in this particular number, all of the contributions that we shall reproduce in full or in part, a rough survey of the issue will indicate that a wide variety of crafts and occupations are represented and that contributions were received all the way from mechanical department executives down to apprentices.

The judges had a difficult task to decide upon the winners. Many of the suggestions were such that they could be applied promptly. Others could not be productive in a large way until considerable time had elapsed after their application. Obviously, because of the nature of the contest and the emergency with which our country is faced, those which could not insure reasonably prompt results were set to one side, so far as consideration for the first and second prizes was concerned. The more important of these, however, are either used in this issue or will appear later, for this promises to be a very long drawn-out war and we shall need to apply every device possible to increase production and keep the equipment rolling.

The next point that received consideration was the extent of the speeding up of production or greater availability of the equipment which might result from the suggestions which were made. This naturally eliminated a large number of contributions which are excellent in themselves, so far as the activity which they represent is concerned, but could not qualify in the large for one of the prizes. As a matter of fact, it was apparent that there were no one or two, or a dozen, or a thousand suggestions that could bring about the results which are necessary, if the railroads are to make good in meeting the demands that are to be made upon them. Every possible advantage must be taken of even little and seemingly unimportant things if we are to win out.

Practical Value of Morale

Another factor that greatly impressed the judges was the large number of contributions which emphasized the fact that possibly the greatest potential force which could be developed in the emergency was that involved in a more intelligent and thorough participation by every worker in helping to bring up the efficiency and production in the mechanical department. This will require a rapid building up of the morale, which, of course, is a responsibility of management. Here lies one of our very great possibilities, if our officers and supervisors can adjust themselves quickly enough to the situation and develop a spirit of cordial and intelligent co-operation on the part of every man under their direction.

We Need Your Individual Help

While many of the contributions are reproduced in this issue, or will be in the next two or three issues, it does not mean that the *Railway Mechanical Engineer* is content with what has been accomplished. We have only started on our program. We can only make the largest contribution if our readers will co-operate with us to the fullest extent by helping, on the basis of what has already been presented, in pointing out other and better ways to increase the efficiency and production of every phase of the mechanical-department activities. We not only invite you to join with us in this effort, but we plead with you to work with us and assist us.

Greater Equipment Capacity Secured By

Increasing Availability

By N. M. Trapnell and J. B. Blackburn*

First Prize Winners

Locomotive availability can be increased by reducing time at terminals—Car repairs can be speeded up by the proper segregation of work

N. M. Trapnell

J. B. Blackburn

ONE of the most important problems facing mechanical department officers on American railroads today is the necessity for increasing the availability of locomotives and cars. This necessity exists because of the increasing amount of traffic which the railroads are being called upon to handle, combined with the difficulty and length of time required to obtain additional units of equipment.

The problem is intensified by the present labor and material situation. Defense industry is necessarily absorbing a large part of the skilled labor supply, making it difficult for the railroads to obtain the mechanics required to maintain their equipment. The same condition exists in the case of materials, many of which are now rationed on a strict priority basis. This situation will undoubtedly become more difficult for the railroads before it improves.

There are two principal phases of the problem which are closely related but which tend to oppose one another in accomplishing the desired result. They are (1) the necessity for maintaining the equipment in the best possible condition to avoid failure and road delays; (2) the necessity for reducing to a minimum the time required for repairs and servicing at shops and terminals.

These two phases, together with the labor and material situation, require considerable ingenuity and good judgment on the part of mechanical department officers in solving the problem. However, solved it must be if the railroads are to handle successfully the abnormal amount of traffic created by the present emergency and defense program. In other words, the railroads must now make more use of equipment they have than when the supply of locomotives and cars was plentiful.

Under present conditions, the active life of a locomotive or a car may be divided as follows:

LOCOMOTIVES

(a)—Time on road hauling trains.
(b)—Time at terminal for servicing and inspection.
(c)—Time in enginehouse or shop for repairs.

CARS

(a)—Time on road moving in trains.
(b)—Time in terminal yards for switching, classification and inspection.
(c)—Time on repair tracks or in shop for repairs.
(d)—Time loading and unloading at origin and destination.

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In the case of the locomotive, parts (b) and (c) are under the control of the mechanical department, and this amounts to approximately 30 per cent of the total time. In the case of the car, the mechanical department controls part (c) and a portion of part (b), which amounts to less than one per cent of the total time. It is proposed in this article to discuss ways and means of reducing the time, controlled by the mechanical department, that have been tried and proven under actual operating conditions without introducing radical changes in present practices or excessive expenditures for facilities.

Scheduling Locomotive Running Repairs

One of the most fertile fields for improvement in the availability of motive power is the method of handling running repairs; therefore, the time required and the quality of work performed must be given careful consideration. There are two principal methods of handling such repairs, i. e. (1) perform the work currently as the need for repairs becomes evident; (2) concentrating the work, as far as is possible, at monthly, quarterly, semi-annual and annual inspections.

The first method is the oldest and is most generally used; it has, however, certain disadvantages which are becoming more widely recognized, particularly on the larger roads, as the demand for power becomes greater. This has resulted in a trend toward the second method.

Running repairs must, of course, be made if and when the need becomes evident; otherwise engine failures and road delays will result. However, the time at which the need becomes evident can be controlled to a large extent by anticipating the work required and scheduling it to be performed somewhat in advance of the need.

When running repairs are made only as the actual necessity develops and no attempt is made to anticipate the work, the locomotive must frequently be held out of service between periodical inspection periods. Also, the amount of work required on incoming locomotives is not known until after they arrive at the terminal and an inspection can be made. This renders it difficult to maintain an accurate check on the condition of the locomotives at all times and to supply the motive power requirements of the service, unless an excess number of locomotives are available.

Another disadvantage in the first method is that the amount of work to be done in the enginehouse may fluctuate to a great extent. For instance, it may happen that several locomotives will arrive at the terminal within a short time, all requiring a considerable amount of running-repair work before they can be despatched, while at other times there may be little work required on the locomotives at the terminal.

This means that if the locomotives are to be despatched promptly, there must be a sufficient force on hand at all times to take care of the peak requirements on running repairs, otherwise there will be a delay in getting some locomotives ready when the work is heavy. Under these conditions it is sometimes difficult to keep all of the force busy during slack periods, which results in an increase in the cost of running repairs. On the other hand, if the running repair work is concentrated as far as is possible at periodic inspections and if these periodic inspections are distributed evenly throughout each month, there will be a reduction in the time out of service for repairs and it will be easier to maintain a balanced efficient force in the enginehouse.

In addition to this, the following benefits will be derived:

(a)—Most of the running repair work will then be scheduled in accordance with the inspection schedule.

(b)—The condition of the motive power will be known in considerable detail at all times.

(c)—The amount of work to be done in the enginehouse each day can be determined accurately beforehand.

(d)—The availability of the locomotives will be increased.

(e)—The cost of running repairs will be reduced.

It is, of course, not possible to confine all running repair work to periodic inspection periods; the bulk of it, however, can be if the system is properly organized and the only work to be done on a locomotive between such periods should be either that of a minor nature or that resulting from accidents and other similar unforeseen circumstances.

It may be said that, under method No. 2, (namely, concentrating work at inspection periods) the time required for periodic inspection will be increased and that there will be an increase in the cost of material because some of it will be renewed before it is completely worn out if repairs are anticipated. This is true to a certain extent, but experience has demonstrated that the advantages of this method far outweigh the disadvantages, particularly where many locomotives are involved.

When handling running repairs in accordance with the second method, such work as renewing rod bushings, crown brasses, truck journal brasses, cylinder or valve packing, taking up lateral, babbitting crossheads, renewing staybolts, rolling and welding flues, testing and grinding superheater-header joints, renewing springs, tightening pedestal binders, adjusting wedges, etc., should be done at the inspection period when it is thought that such items will reach the condemning limit, leak or fail, before the next inspection period. This is in addition to the work required by the laws, rules and instructions of the I. C. C. Bureau of Locomotive Inspection.

It has been found helpful, where this system has been adopted, to provide a form covering the work to be checked or done on periodical inspections. This form lists the various items to be taken care of with space for recording the repairs made and the name of the man making each repair. The use of such a form helps insure that all necessary work is done and provides an excellent record of repairs made and of the condition of the locomotive.

The second method of handling running repairs was devised originally to reduce cost and stabilize the maintenance force in the enginehouse. It has since proved invaluable in increasing the availability of the motive power. In certain cases it would now be impossible to operate under the older hit-or-miss method of taking locomotives out of service for repairs only when the need for such work becomes imperative, without a considerable increase in the number of locomotives required to handle the service.

Adequate Supervision of Outside Forces at Engine Terminals

In general, the maintenance forces in shops and enginehouses, which include the skilled mechanics performing repair work, are organized with reasonable efficiency and are adequately supervised. More attention is usually paid to the supervision of these men than to the so-called "outside forces" which include hostlers, coal-dock men, fire cleaners, watchmen, supply men, etc.

In many cases the supervision of the outside forces is inadequate and much can be accomplished toward expediting the dispatching of locomotives if adequate supervision is provided. Such forces are composed principally of unskilled labor which must be followed up more close-

ly than the skilled maintenance force. The supervision required depends, of course, on the size of the engine terminal, the number of locomotives to be dispatched and, to a certain extent, on the facilities available.

The outside force handles the movement of locomotives about the terminal, taking on coal, water and sand, cleaning fires, blowing down boilers, washing locomotives and the checking of tools and supplies. They also unload and elevate fuel coal at coaling stations, dry sand, clean ash pits and, in many cases, fill lubricators and grease plugs and pack journal cellars on the locomotives. They are responsible for the time required to get the locomotive into the enginehouse for repairs after it is received at the engine terminal. This may take from one to four hours depending on the amount of work to be done, the size of the locomotive and the arrangement of the facilities, and accounts for a considerable proportion of the total time required to dispatch the locomotive.

It is too much to expect one enginehouse foreman to supervise directly the outside forces handling this work in addition to the running-repair forces in the enginehouse at a busy engine terminal. However, such is the case in many instances. It has been found that the time required to get locomotives into the enginehouse after arrival at the terminal can be reduced from 20 to 50 per cent by having adequate outside supervision.

The outside supervision required will depend on the size of the terminal and the number of locomotives being handled. At large terminals during busy periods, it is often advantageous to employ an outside, or ready-track foreman, who has direct supervision over all outside forces and their work, and who reports to the enginehouse foreman. At medium-size terminals the coal dock foreman can often be made responsible for the work of the outside forces and getting the locomotives handled promptly. At the smaller points, where labor agreements permit, it has often been found advantageous to appoint a lead hostler, or working foreman, who, in addition to hostling locomotives will exercise supervision over outside forces and expedite locomotive handling.

Terminal Facilities

It has been found that the arrangement of terminal facilities not only affects the time required to despatch locomotives but also the performance and time spent on road. For instance, stuck wedges and corresponding hot journals as well as rough-riding locomotives can be eliminated by providing inspection pits so that wedges can be adjusted as soon as the locomotives arrive at the terminal while the boxes and their component parts still have their running temperatures. Experience has proved conclusively that, depending on differences in box design, thickness of crown brasses, etc., the expansion and contraction of boxes will vary to such an extent that wedge adjustment cannot be made accurately except under running temperatures.

Likewise, by providing facilities so that the driving boxes can be inspected and packed while they still are at running temperatures, better lubrication will result and a percentage of hot journals will be eliminated because there will be sufficient heat to soften the surface of the grease and allow it to start flowing through the holes in the perforated plate in the cellar. When boxes have to be packed cold as is the case when locomotives are outshopped after being given classified repairs this can be accomplished by pressing the grease cake in the perforated plate under a hydraulic press or by applying soft grease on the axle side of the plate, or both.

Experience has also shown that in many cases the servicing of equipment can be expedited by the relocation of coal, water, sand and ash pit facilities. In other words, if these are conveniently located and so spaced that the operations of coaling, sanding, cleaning the fire, filling the tank, greasing and filling the lubricators, etc., can be performed at one time the result will be an increase in efficiency and a definite saving in terminal time. Likewise, particularly at the larger terminals it may be found advantageous to provide multiple coal, water, sand or ash-pit facilities.

Many benefits have been derived from the establishment of the "dual inspection system," that is, by maintaining the usual inspection of the power before it is moved into the enginehouse and supplementing this by a second final inspection after all work reported has been done prior to returning the locomotive to the ready track. Where this cannot be done in the enginehouse, outbound inspection pits should be provided.

An excellent method of reducing terminal time is to expedite the blowing-down of locomotives. Most roads have found that the use of treated water and a blow-down system is either necessary or desirable. In a great many cases, particularly in bad water districts, considerable blowing is mandatory to reduce the concentration of dissolved solids in boiler wash and to remove the sludge participated by the treatment.

The application of blow-off mufflers of the overhead type materially aids in reducing terminal time because with locomotives so equipped it is not necessary to blow the locomotive at some predetermined point but they can be blown safely at practically any yard location.

It has also been found that the amount of terminal blowing necessary can be reduced by equipping the locomotives with and using a continuous blow-down system on line of road. This can then be supplemented by hand blowing when water conditions make it necessary.

Freight-Car Repair-Track Work

Freight-car repair track work, like that in locomotive enginehouses, should never be speeded up at the expense of maintenance. The correct balancing of the available forces and adequate supervision along with the re-arrangement of existing facilities will increase repair-track production and obtain maximum efficiency.

An outstanding improvement that can be made in freight-car running repair work is the adoption of a so-called *wheel* "spot system," whereby all cars requiring wheel work are placed on a separate track, adjacent to the wheel storage tracks, set aside for this purpose. The wheel spot should be located about midway of this separate track so that the cars shopped for wheel work can be placed on one side of it and the finished cars can be pulled off the other side. This wheel spot should be equipped with (1) a winch for pulling cars along the track on and off the wheel spot; (2) concrete foundations for lift jacks at each end of the car spot; (3) ball-bearing wheel carriage set at a 90 deg. angle adjacent to the wheel storage tracks; (4) special hoist for lifting truck side frames and bolsters; (5) swing air hoist for unloading new and loading scrap wheels and (6) a shallow concrete pit at this point, approximately 18 inches deep, is also desirable.

The wheel spot arrangement has been found to decrease both labor and time required for this type of work and has also been found advantageous for performing any other work requiring jacking at this point.

Another improvement in freight-car running repairs can be made by making a careful inspection of all cars placed on the repair track for one defect so that all other necessary work can be performed to insure that it will not be necessary to set it out at some other repair point in the near future.

Efficient Handling of

Freight-Car Repairs

P. A. Helm

By P. A. Helm*

Second Prize Winner

Classification of cars for running repairs and specialization of gangs effects more intensive use of fewer tools and tends to improve the quality of workmanship at car repair points

THE American railroads in 1941 handled more tons of freight more miles with less locomotives and cars than during the prosperous times following World War I, and while we railroad men can feel elated we can look to the future and particularly this year as the time when this achievement must be surpassed. To do this it will require that our motive power and rolling stock must be maintained serviceable to a higher degree of availability than ever before. This can and will be done. The key is efficient scheduling of the work and proper classification of it as much in advance as it is possible to contemplate.

The key to efficient repair and reconditioning forces for rolling stock is the proper classifying of the equipment as it arrives in the classification or train yard. The yard forces should consist of sufficient competent equipment-department men for train and car inspection to make the necessary running repairs in order to prevent the removal of cars from the train and to properly classify the bad-order equipment taken therefrom; also to select the non-defective but non-serviceable freight equipment for placing on clean out or wash tracks in order that they can be put into serviceable conditions with a minimum delay. Defective equipment requiring only light repairs, (less than 15 man-hours per car) that is renewal of wheels, couplers, other miscellaneous light-repair jobs, should be classified so the operating department will place them for efficient repair-track operation. The cars requiring only light repairs should be grouped: (a) loads; (b) foreign equipment; (c) owned empties; and preferably located where sufficient repair tracks are available for separating the owned open-top and the closed cars. Owned cars requiring other than light repairs, that is, cars requiring classified repairs (more than 25 man-hours per car), should be separated and not placed on the light-repair tracks, but held available for placing according to instructions from the mechanical department.

Placing light repair cars in the manner outlined will permit the repair forces to be organized for class work. Each workman is usually better qualified to perform a particular class of work and this is usually the job that he likes best to do. By having the repair forces so organized, they are broken down into smaller groups or gangs for: (1) truck work; (2) air-brake work; (3) body repairs, including the work usually performed on the car from the floor up, including the roof, running boards, etc.; (4) steel gangs, which should be separated into sufficient men for removal of rivets, fitting up the parts and riveting; (5) painting and stenciling.

Utilize Fewer and More Efficient Tools

This organization permits the work to progress almost in the order outlined and with a considerably smaller quantity of more efficient tools, particularly air tools such as air drills, air hammers, etc. For example: one repair-track force prior to class work required 20 50-ton hand-operated car jacks for raising the ends of loaded cars; by classifying the work in order that certain gangs would do practically all the car jacking, six air-operated jacks were sufficient. Even though the latter cost twice as much, since only one-third the number were required, the cost and the time of doing the job with the modern tools versus the hand-operated tools is less than one-third and the investment in the tools is considerably less.

This is also true with other tools. Consider a light repair force of 40 men, grouped in approximately equal gangs under the old method of repair work, with each gang doing all the work on the car to be repaired with the exception of the air-brake repair work, painting and stenciling. The repair forces will require 18 pneumatic hammers, 18 pneumatic drills for wood or steel work, 8 rivet-heating forges, etc., with all of the usual tools

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required by such workmen, and each of the tools will be used less than two hours a day. With the progressive or class-work system, this same force doing even a larger volume of work requires only three pneumatic hammers, six drills, three rivet heating forges and all other tools in proportion, but all of the tools are used almost the entire 8-hour day. Yes, the tools will wear out sooner, but with a smaller stock new and modern tools may be purchased more frequently and workmen always do better work with new and modern tools.

Unit Fabrication of Individual Car Parts Recommended

When building new cars, or rebuilding old cars, it is the common practice in an efficiently operated shop or on repair tracks to fabricate all steel parts; completely mill all lumber; and then process or assemble all of the parts possible into jigs, forms, etc., assembling these into as large a unit of parts as possible to deliver to the assembly tracks where erection facilities are available such as overhead or portable cranes. The same practice should be followed at repair tracks or in shops doing light repairs or classified repairs, particularly where a large number of owned cars are being repaired. This procedure permits the use of compression riveters, portable and stationary electric welders for the assembly of such steel car parts as steel side doors, the attaching of brake-beam safety straps and bottom-rod supports to truck spring planks, end and side ladders, and all other parts which can be applied as a unit. These parts can then be replaced as a unit, it being more efficient and economical to replace such parts as a unit in preference to endeavoring to repair them at the car. For such parts, repaired in a fabricating or assembly shop, the cost or the time of repairs is considerably less. In numerous cases, it is found that the cost or time of doing the work in this manner is less than one-half that of doing the work at the car. For example: driving rivets at the car with an air hammer, compared with driving rivets with a compression riveter at the assembly or fabricating shop, is usually twice, and sometimes three times as great in cost or time. Then too, when such work is so assembled, it permits a more efficient use of tools and promotes better workmanship.

Electric or gasoline crane trucks and rubber-tired trailers are an essential factor in the handling of materials, in the changing of wheels and in the application of couplers and heavy draft gears.

Roller Racks Facilitate Material Handling

The use of modern roller racks or ball race tables with the vertical power punches, vertical drill presses, and wherever they can be used to advantage, is recommended for handling materials between the machines and between the machine and assembly benches as well as for unloading of material from cars. Roller racks, properly placed, will permit two men to unload various classes of repair parts from a car into storage piles 10 to 15 yards distant and eliminate the tiresome trucking, doing the work in numerous cases in from 30 to 40 per cent of the total time required for trucking. Records will show that two men can pass large quantities of car decking from storage piles to the cut-off saw, moving from 90 to 120 ft. over a roller rack properly placed, in less time than required by four men when handling by trucks or otherwise.

A ball-race table attached to a vertical power punch will permit one operator to handle plates for punching even though some of the plates may weigh up to 600 lb. and will enable the one operator to push this plate around with ease and obviate the necessity for a helper. Any vertical power punch with at least a 24-in. deep throat should be equipped with a small duplicator table which will eliminate the laying out of parts, particularly plate punching, especially when there are ten or more identical pieces to punch. This will enable one operator to work efficiently and again obviate the necessity for a layout man and for any additional help.

New facilities and tools for repair work have developed rapidly in the past few years and a test of some will surprise the man who has not tried them and who has failed to change his old practices. A portable gasoline driven electric welder will surely surprise the man who uses it to weld holes in the side or end sheets or in the roof sheets of all-steel cars; or who uses it to put a patch or splice in a side or end sheet on either open-top or house cars; or to apply a shim to a coupler carrier iron, A. A. R. Rule 20, without removing the coupler; or to weld a corner or side stake on a steel car. In most cases, the cost or the time for doing the job with the modern portable electric welder is less than one-half the cost of using rivets or sending the parts to the blacksmith shop for repairs.

Using pneumatic hammers with especially designed cutting chisels makes the splicing of inside lining on box cars possible, permitting the repairman to renew one-half or one-quarter of the board in lieu of the whole board or several boards usually renewed.

Box cars contaminated with oil or grease spots, after ordinary sweeping and cleaning, can have such spots covered with an approved sealer applied with spray or brush, and the car can be retained in a Class A condition for high class commodity loading without the removal of large parts of the lining, flooring, etc.

Straight-Line Method for Classified Repairs

For classified repairs, by all means keep the cars moving down one track where the shop or repair track is equipped with double-end tracks, doing the work in a progressive manner. The best results are obtained by working them in special lots or classes, but this does not mean that it is necessary to accumulate large numbers of cars in order to have a special lot or class of cars before doing the work. For example: when 500 cars are to be repaired (five types of 100 each) they can be handled by grouping them into ten groups of 50 each, or even twenty groups of 25 each. It is not necessary to accumulate the entire 150 of each type before the work progresses on each lot. Here, by all means process all parts and assemble them into as large a unit as possible. The cost or time involved will be considerably less and better workmanship is obtained.

Where sandblasting cannot be used efficiently on some classes of cars, a high-speed rotary-type air or electric motor with circular wire brushes will prove advantageous and economical in the removal of rust and scale from the exterior preparatory to painting.

Painting should be done with a low-pressure air-operated paint spray, using the quick-drying or two-coat-a-day paint. By the use of the low-pressure type of paint spray the painting of the cars can progress on the same track as other repair work.

Plan Ahead for Materials

To repair cars and locomotive we must, of course, have materials, and today we must contemplate our requirements for such as far in advance as possible. Our stores and purchasing departments must be given a reasonable time to secure the materials to meet our requirements. Some of our standard materials, which we are accustomed to use, cannot now be obtained because of the national defense requirements and sub-

stitutes will unquestionably have to be used. A closer cooperation of the mechanical, stores and purchasing departments will be necessary.

Railroad transportation is a national defense necessity. It is doing a fine job efficiently. Efficient mechanical-department operation is a transportation necessity and we must insist on the replacement of all worn-out and obsolete facilities, equipment and machinery, even though they may be difficult to purchase. When the mechanical department requires a new machine, tool or facility, it can easily be proven to the management, who will be pleased to assist them in securing it. Previous timidity and reluctance on the part of mechanical-department officers must be set aside in asking for the replacement of such or the acquiring of additional facilities that will permit the work to be handled more efficiently. When acquiring a new tool or facility, the important factor is to arrange the work so as to keep it in constant use. A daily requirement for driving 6,000 rivets would permit the job to be done with five pneumatic hammers, driving 1,200 rivets each, providing the work is properly classified. Improper classification of the work may require ten hammers driving 600 rivets each. In the latter case, each tool would be working only a portion of the day. A factor to remember is that a three-hundred-dollar tool, working eight hours per day, is far more economical and efficient than a one-hundred-dollar tool working two hours per day. A more efficient tool, even at a higher cost, is always more economical if the work is arranged to get the full benefit of it.

Bad-Order Equipment Percentages Must Be Further Reduced

The time has arrived when new cars and locomotives can be secured only in limited quantities and this supply may get smaller. The American railroads in December, 1941, had fewer cars and locomotives in an unserviceable condition, in proportion to the total ownership, than ever before, but now is the time to keep every locomotive and car in a serviceable condition every day. When cars are cut out of commercial service due to bad floors, sides or roofs and the cars require classified repairs, quite a few of them can be temporarily conditioned for some restricted company service at a nominal cost. Every such car used releases another that is serviceable for commercial service. Then too, this same equipment will be ready for classified repairs when the materials and the forces are available. In this way, therefore, we lose the use of the car only during the time it is actually in the process of repairs.

Proper classification of car repair work must be the direct responsibility of the man in charge, and his immediate supervisors must accept the responsibility of directing and completing the work as scheduled. For efficient operation, the man in charge and his immediate supervisors must have the good will of the entire working organization. High-class workmanship and efficiency is the result of labor by men who enjoy their jobs, and the workman who enjoys his job will advance ideas, if asked by his immediate supervisor, as to how the job can be made easier, safer or how it can be done more quickly. Most contented workmen will usually respond in a manner that will lead to improvement. After all, is not the workman of today the supervisor of tomorrow?

National-defense production must increase considerably, but it can do so only to the extent that the mechanical-department men of the American railroads keep pace with the requirements for motive power and rolling stock. Our answer must be: "We will do our job."

* * *

Release the Full

Potentialities of the Men

HERE are a series of contributions related, in most part at least, to the great contribution in increased production that may be secured by a better understanding and handling of the human element in the organization. This section is in fact a distinct challenge for better leadership.

Some of the contributors are men in the ranks, and because they are so sincerely interested in winning the war they are quite frank and to the point in their statements. It would be well to read this section with a view to utilizing a vital factor in the problem of securing more efficient and greater production.

What a delicate thing this matter of morale is! How easily it can be discouraged and destroyed! How easily also it can be developed into something live and dynamic, if it is properly understood!

After all we Americans, under the skin, are intensely patriotic—*when we stop to think.* Also we are fighters and idealists. Thank God that under stress we do know how to fight together, shoulder to shoulder. But this must necessarily be predicated on a high type of morale.

These contributions deal with the delicate problems of human relations — They all affect that important but intangible quality of an organization's morale

When you have read this section and while you are still pondering over it, turn back to the stories in the first three issues of this year of those mechanical department leaders whose careers and personalities are there depicted. Is it not true that their success as executives is largely due to the fact that they appreciate keenly the human values in their organizations?

Man Is More Important Than the Machine

Suggestions as to how man-power may be used more effectively

By S. W. Selden,

R. F. & P., Richmond, Va.

The American railroads are faced with one of the greatest problems in their existence. The demand for transportation is, or will be in the coming months, greater than at any time in the history of railroading. Along with this demand there exists a shortage of skilled manpower, new and improved machine tools are almost unobtainable, and adequate additional power and equipment seem to be out of the question. Since there seems to be little hope of adding to existing facilities, it remains for management to attempt to improve the efficiency of maintenance and operation of present equipment.

Many railroads, forced by the depression of the thirties, have already made tremendous strides in conservation of material and manpower; but further drastic steps must be taken.

Modern warfare is based upon movement, and nothing could defeat our nation so quickly as a confused and snarled transportation system. The railroads must go "all out" to help win the war.

One fact has tended to become obscured in the development of the modern machine age; that is, the man is always more important than the machine. No machine or plant can be any better than the human intelligence and skill that devised and operates it.

Placement of Workers

The best way to produce more with existing facilities is to pay more attention to the man behind the machine. Railroads have too long operated on a laissez-faire system when it comes to the utilization of manpower. Many men are obvious misfits in the jobs they hold, yet very little attempt has been made to find the round holes for the round men, the square holes for the four-cornered men.

Greater Specialization

This is the day of specialization. We have learned that a man can be trained to do one thing with far more accuracy, speed, and efficiency than he can do a number of different and sometimes unrelated operations. It is entirely possible that the railroads could learn a great deal from the automotive industry. Surely, the unit system, or assembly-line method, which automobile manufacturers have found so profitable, could be adapted for the back shop of any large railroad. The average hard-shell railroad man will dismiss this suggestion as impractical, citing the huge weight of locomotive parts, etc., but the automobile manufacturers have already refuted this argument by turning out on their assembly lines tanks as large as locomotives.

Many man-hours are lost every day by mechanics or helpers making trips to the storeroom for material. Some system whereby material could be delivered to, or placed on the job, should be worked out. The particular method would depend on the size of the shop, volume of work handled, etc.

Intensify Inspection

With the greater demand for utilization of locomotives and cars, there is apt to be a relaxation of inspection, the idea being to keep power and equipment rolling as much as possible. This is a mistaken policy. A single undetected defect could cause a serious failure which would undo many months' economy. We can ill afford to take chances on "tying up the road." Inspection should, if anything, be intensified.

When locomotives and cars are shopped for minor repairs, it will often save time to make the periodical tests and inspections, even though they may not be due at the moment. If time can be saved in the long run, what does it matter if a locomotive is given, say, a yearly test after only eleven months of service? The long-range viewpoint is needed. We must not get our noses so close to the grindstone that we can't see what we are doing.

Enginehouse a Bottleneck

The roundhouse often represents a bottleneck in locomotive utilization. A check of the normal roundhouse routine might result in the telescoping of many operations, thereby reducing the time locomotives are unavailable. Unfortunately, too often management is reluctant to disturb the "status quo." It is afraid to make any drastic changes for fear of upsetting normal routine. However, progress is achieved only by doing this very thing. The man who says "It can't be done," is nearly always wrong. These are difficult times and sweeping changes will be necessary if we wish to survive.

Throw Wasteful Practices Overboard

The railroads will come through with flying colors only if they realize this necessity for closer integration and organization, only if they do not hesitate to throw overboard the old wasteful practices that have seeped in through the years. Red tape must be cut. Operations must be simplified and standardized. Authority must be more concentrated. "Laissez-faire-ism" must go. In its place, the railroads must substitute intelligent planning, a more complete utilization of its manpower, and a correspondingly greater output from its existing plant.

To this end, it behooves management to survey its present practices and facilities. It is not enough to grope along "the best we can." Shops and men as well as trains must be stream-lined.

The Workers Pledge Co-operation

Must do our best to out-produce, out-fight, and out-wit the enemy

By A. J. Cochran*,

President, Federated Shop Crafts, Chesapeake & Ohio, Clifton Forge, Va.

Today, as never before, there is a crying need for greater co-operation in the railroad industry, as well as all other lines of activity. We have all been suddenly taken from a condition of severe depression to that of an all-out effort on the part of America to keep the Torch of Liberty brightly burning in a dark world.

We will have to unite our efforts to successfully overthrow the enemies of Democracy. To do this we need and must have greater co-operation between management and employees; co-operation between one department and another, both of foremen and men; co-operation between foreman and men in their respective departments, and, in general, co-operation from the presidents of the various railroads down to and including the humblest laborer.

Pooling Suggestions

I am a strong believer of suggestions and exchange of ideas between foremen and men or duly elected representatives of the men. The man who knows it all does not exist today; therefore we can learn a great deal by carefully considering the other fellow's ideas or suggestions.

I have just closed out a business that I personally operated for 10½ years and had employees who offered suggestions which proved very successful in my own business. The man who operates the machine has a greater knowledge of the potential possibilities of that machine than does the foreman in many, many cases. Likewise the man at the bench can discover more ways of saving time as well as material than the man in the office.

The foreman should not resent the suggestions from the operator of the machine or work bench, as is so often the case. There are many other jobs, and in all departments, where employees can offer very beneficial suggestions but hesitate to do so because of resentment of foremen shown when suggestions are offered.

As the duly elected representative of the Federated Shop Crafts in my shop, I wish to say our entire committee has pledged itself to co-operate in every honorable way possible to assist our master mechanic, general foreman and other foremen in getting the best results obtainable during this great emergency. This pledge we mean to keep.

We realize that there is a shortage of mechanics; therefore we urge our men to work every hour (both straight time and overtime) possible. It matters not how good a mechanic may be, he is of no value when laying off; therefore we are urging regular work, greater interest in our respective jobs, and above all helpful suggestions that will make for greater production and output during this grave emergency. We are determined to do our part and covet the co-operation of every foreman and man in our entire shop and throughout our great railroad system.

1942 Record Must Better That of 1941

Our master mechanic and general foreman tell us that our division made the best showing of any division on our railroad last year. We are very proud of this record but will not be satisfied until we know that the 1942

* A machinist with more than a quarter-century experience in railroad work.

record has far surpassed our good record of 1941.

Careful planning and sober thinking made America great. Let's keep her great by more careful planning and more sober thinking than ever before. The B. & O. slogan of 20 years ago, was then (when I worked for them) and is yet, mighty good concerning material. "Material to wear out, but none to rust out." The American workers say to the foes of Democracy, we will *outproduce* you, we will back our boys in the service to *outfight* you, and we will all unite with our government to *outwit* you and bring you to defeat, by the Grace of God.

Express Appreciation for Good Work

Will do wonders in bringing up production—
Frank statement from an apprentice

By R. T. Milburn,
Ft. Worth, Texas

As far as time is concerned, I am a rank new-comer to the railroad industry. Only two short years ago I started serving my time as a machinist's apprentice. Regardless of my inexperience and age, though, I feel that I am old and experienced enough to know when a job is being done right and when it isn't.

During my time as an apprentice never have any of my superior officers ever come to me and patted me on the back and told me that I was doing a good job. Instead it has always been rank criticism on their part. I am just an average young man trying to make good, I know, but sometimes even the poorest of us makes an effort, which, if it were recognized and complimented, would give us an incentive to work and try harder.

I am not speaking for myself, alone; practically every man with whom I have an acquaintance on my particular railroad has had the same experience I have had with the foremen and the higher officers.

Now, the railroads, and every other industry for that matter, are faced with the task of getting the most out of what they have on hand. How are they going to do it, is the question? We have sufficient men and equipment in our shops to turn out more than 30 per cent more work than we are now. Since it is now a question of patriotism, we can and will do our part toward national defense.

Railroads have long demanded courtesy on the part of their employees. The managements should look behind their own door before they try to make their employees do something that they are not shown by their management.

I worked in my shops for more than six months before I knew what the master mechanic looked like. Above all the rest of the foremen, that man alone, should meet each new man personally and tell him what he is doing there and how much the company is depending on him to do his part. Let the man feel that he has a place in the business, an important place.

Should each man be treated personally with respect and consideration that is demanded of him, he would be a good man to have around. His enthusiasm for his company would go outside with him and reach other than just his immediate family.

It seems that the foremen think they are better than the men that work for them, that they are too good to associate with a man who wears overalls, when they, themselves, before they were given that little bit of authority wore them themselves.

My plan to increase production with what we have is simply to let the man higher up treat the man below him just as he likes to have his superiors treat him. If this is practiced by each and every man in the shops, regardless of rank, creed or color, the railroads will not have to wonder how they are going to increase production; they will see it being increased.

Leadership and Education

Truly they are invaluable tools

By Harry C. Fletcher,
Boston & Albany, West Springfield, Mass.

Leadership and education are the tools which will produce the quickest results, the most satisfactory results, the most enduring and the most economical results. Super-power leadership will haul more traffic than super-power locomotives. Leadership will reduce friction in our department as roller bearings reduce friction in our equipment.

With leadership carrying the load, a definite force will haul a greater tonnage, or the same tonnage will be hauled with considerably less effort. Leadership lightens the load by dividing and sharing its problems. Leadership recognizes its responsibilities and does its best to solve its problems before blaming the stores department, the operating department, the railway supply industry, and everyone but itself.

Leadership reproduces itself. It builds men to succeed itself and often builds a product better than the original.

Leadership improves production, for men respond to

its contagion. Good men will do their best and others will do better than formerly.

When we think of mechanical department education we visualize an apprentice training program. A program such as the "Report on Apprenticeship" presented before the last convention of the Locomotive Maintenance Officers' Association. This report published in the October issue of the *Railway Mechanical Engineer* should be read by all mechanical department supervisors, and if the report is entered in this contest the committee on apprenticeship will be awarded the first prize.

After apprenticeship, what? Education and more education, especially education for leadership. Graduate apprentices and others who are potential leaders should be encouraged to continue their education along these lines.

Railway supply representatives furnish the majority of the supervisors with their technical education. (Why make the apprentice attend school on his own time when the supervisor gets his education on the company's time? This may be an important question, or is it?)

Gang leaders should be required to complete some course in foremanship before being considered for positions as supervisors. They assume the responsibility of spending thousands of dollars of the company's money and it is of more importance that they appreciate and understand the efficient direction of millions of dollars' worth of man-power.

It is doubtful if there is any "best" course in leadership and the results will vary with the personal reaction of the student. All are better than none, and many are excellent. To mention one book, not because of its excellence but because of its popularity, I have never heard of a supervisor being any less efficient because of his having read Dale Carnegie's "How to Win Friends and Influence People."

Leadership and education are the two most effective tools capable of producing the solution of the mechanical department's present and future problems.

How to Stimulate to Greater Individual Effort

A number of devices to build closer and more intelligent co-operation

By Walter Cress,

Clerk, Car Department, Peoria & Eastern, Urbana, Ill.

The crisis which confronts us today may well be considered the turning point in American economic affairs, and how the railroads meet this crisis may definitely decide the future, not only of the railroads themselves, but it may well mean the success or failure of our entire economic structure. The solution of the railroads' problems rests primarily upon the personnel, upon the men who plan, who direct, and who perform the myriad tasks so necessary to the successful operation of this complex industry.

Building Up Production

Production in the past two decades has increased enormously through the medium of improved equipment, improved working conditions and facilities, improved organization, piece work, etc. Piece work alone, at points where it is used, has speeded up production by furnishing an active incentive to produce, and by instilling in the employee the desire for efficiency and production. Where properly supervised, without impairment of the quality of work, piece work should be extended to more shop and repair facilities.

Where piece work is not feasible, a check up should be made of supervision, since many in a supervisory capacity have gotten into a rut, and through favoritism, laxity in discipline and negligence have tended to reduce production.

Eliminate Saboteurs

In recent months another and yet more dangerous enemy of production has crept into the railroad industry. I refer to the growing trend toward radicalism in labor organizations, partly through precept and example of organizations in other industries, and partly perhaps from a concerted plan. Radicals, agitators, etc., have cropped out in the otherwise peaceful relations between labor and the managements of the railroads. Growing dissatisfaction and unrest is becoming more and more noticeable, fanned and fostered by these obnoxious trouble-makers. Petty grievances, growing ever more numerous, unless reduced or eliminated, are potential sources of real trouble, and certain curtailment of production. These agitators and radicals should be weeded out so that the average railroadman, who is fundamentally a pretty fair sort of a fellow may resume the even tenor of his existence. For a satisfied workman is an asset, while a dissatisfied workman is a liability. A little investigation should prove conclusively who the trouble-makers are, and after they are weeded out a unified plan should be developed to draw the personnel into a solid group, working for the industry and for themselves.

Suggestions for Improving Cooperation

The need for cooperation is now greater than ever before, and in the light of increasing seriousness of conditions will continue to be our most crying need. There is not enough cooperation between employees, between officials, between departments, shops, or roads. The improvement of employee relationships between the motive power and rolling stock departments, between the mechanical departments and the operating departments, would have a tendency to increase production by decreasing delays in handling of and repairing equipment, tools and appliances, thereby resulting in increased efficiency. If a spirit of cooperation and friendly rivalry between departments, shops and roads could be instilled in the personnel, replacing the present feeling of jealousy and envy, much could be accomplished.

A suggested plan toward this end would include contests between shops, departments, repair points and roads, based on production. A plan of this nature could instill a spirit of employee cooperation and pride in shop, department or road, which could not fail to benefit all concerned. The road, shop or department having the best record of efficiency and production should be recognized and be given some sort of an award. This plan could be worked out, based on production or production increase, by units or by road or both, divided into groups

of equivalent personnel and comparable conditions, similar to the safety campaigns which have proved so effective in the reduction of accidents.

The elimination of the duplication of work in the clerical branch would increase the efficiency of the clerical forces, and enable them to handle the increasing demands brought about by the increase in business. A careful study should be made of the various reports, with the thought of eliminating all duplications.

The education of yard forces and agents, and the encouragement of co-operation between them and rolling stock employees in furnishing cars for commodity loading would greatly expedite the movement, handling and repairing of rolling stock. If the yard masters, yard conductors and agents would co-operate with the rolling stock departments, furnishing cars of proper class for specific lading, much unnecessary work would be saved in preparing cars for commodity loading, caused by using a better class of car than necessary.

In view of the growing scarcity of materials greater care should be exercised in the scrapping of materials; many items now thrown into the scrap could be reclaimed, built up or repaired.

All of the foregoing items deal with personnel alone; here are a few other suggestions:

Extending serviceable life of equipment by a more frequent application of paint and rust preventative.

Anticipate equipment needs, in lulls in business, and prepare for them.

Make a careful study of the relative abilities and aptitude of employees, the better to place men in positions where most efficient.

Arouse this Sleeping Giant

With some specific practical suggestions for so doing

By Sherrell Watson,

Topeka, Kan.

In our search for the means of speeding up our production let us turn to the place where the success or failure of any industrial enterprise centers—*the men who do the work*. The finest high-speed machinery even in unlimited amounts under ideal shop conditions cannot, unaided, supply the locomotives, the cars, and the equipment now so vitally necessary. However, even outmoded machinery and difficult material shortages will not keep the railroads from reaching their goal if every workman is inspired to apply himself to the utmost, made eager to not only do his work as usual, but do it better and faster, and is encouraged to use his ingenuity to make himself and tools with which he works do a more effective job.

Collectively speaking, in the ranks of the American railroad workman lie a potential giant which has only to be aroused; awakened to the fact that it is his family, his country, his friends, himself for which he is to put out this increased effort. The day that these workers are all brought to realize that the success of this whole campaign and the very lives of the valiant men under arms, in fact the preservation of our American way of life, may rest squarely on their shoulders production problems will automatically begin to disappear.

Bring Facts to the Men

Giants such as ours are not inspired by pretentious flag waving or flattering speeches, but simple down to earth campaigns of bringing the facts to the men will get results. Show these men where the work they do at the bench or lathe or forge helps form a finished machine that is to do the work which is now so very important. Show them that the better and the faster this work is done the safer are the homes and families of our country. Let each man know that his suggestions for improving his or other men's work will get attention. In fact, give men who produce worthwhile improvements published credit in bulletin form on boards throughout the shop; give them recognition from company officials and bonuses in proportion to the actual benefit derived from their ingenuity and application.

Waste of time and material can be controlled or even completely eliminated if and when it is plainly visible to the workmen that such conservation is essential to the success of our national struggle and he will be personally benefited. Not only effective economy of materials but also reclamation and substitution of materials should be induced. Here lies a rich field, for in their everyday tasks these men are working directly with this material and as a consequence have a rare opportunity to study and develop its more effective use.

Some Specific Suggestions

Let them know that they are not working alone, but that the "front office" is cooperating in every possible way to get the materials needed and that policies and motives of the companies are not selfish and prejudiced. Get the best available equipment into the hands of the men at the first possible moment, and repair and remodel their machines and tools. Give out all the information possible and start voluntary night classes to help them increase their production and at the same time decrease breakdowns and delays by correct speed and feed of machines, by correct sharpening of tools, proper lubrication of equipment and more extensive use of patterns and jigs. Convince them that their safety and well-being is important. Induce cooperation and friendliness between the men of different departments, tolerate off duty social gatherings in an effort to break down suspicion and misunderstanding between the workers themselves, or between workers and their supervisors.

Inaugurate a schedule of work out-put based on accurate figures showing what can and must be done by the whole shop. Break these figures down to determine the quota for each department and finally furnish each worker with the figures showing the production necessary from him. Drive home the fact to each man that his failure means slowing up the production process in the entire shop; but on the other hand, if he completes the work assigned he is speeding up the defense effort affecting our whole country. Work out efficient schedules for material as it passes through its various oper-

ations in the plant so that no delays are caused by congestion of work at one point and a scarcity of it at another. Let each man know that the material on which he expends increased effort will be handled with dispatch not only all the way through the shop, but until it ultimately reaches the place where it can become effective.

Promote Contests

Work up contests between shops of comparable size and facilities. Periodically inform the men of the progress being made by themselves and their opponents. Present individuals of the winning shops with badges, cards, or emblems to signify they are railroad workers interested enough in the welfare of their country to do their utmost for its defense.

Railroad officials can arouse and inspire these men by enlisting the aid of their foremen and supervisors who can in turn have confidential talks with the men explaining tactfully the gravity of the situation, the responsibility entrusted to the railroads and the urgency of speed. Circular letters to the men from well known and respected officials may be used to an advantage. A poster campaign in every shop emphasizing patriotism and cooperation will help perpetuate the challenge.

We realize that the fulfillment of what is advocated here is no simple undertaking, nor can it be accomplished overnight, but the magnitude of the results will justify and in fact compel intelligent and ceaseless effort from every individual or group that in any way affects the thinking or activity of the railroad workers.

Utilize Ingenuity of Workers More Fully

By Hugh Allen Thomson,

Indianapolis, Ind.

There is a wealth of ingenuity in the railroad shops which is seldom used or requested and which would be given gratuitously. This ingenuity is at the *bottom* of the railroad structure, in the workmen. The majority of those hundreds of thousands of workmen are frank, clever, skilled, and superior in devising and combining efforts and suggestions for improvements and savings of material in their individual sphere of work. The majority of workmen are red-blooded Americans who would be pleased to perform double duty in this manner and help in the present state of emergency for an all-out fight to victory.

A patriotic appeal or request may be given directly to the workmen by the management, which will explain to them that the railroad welcomes their intelligence and ingenuity as well as their labor; or some method of giving credit or recognition may be the answer to this.

A set-up similar to the Safety First organization of the railroads may be an ideal method to obtain, acknowledge, scrutinize, and pass judgment on the practicalness of each idea or suggestion received from each workman. The Safety First organization is operated from the *top* of the railroad structure and filters down through all the departments, seeking out and eliminating unsafe and hazardous conditions and practices that may jeopardize the safety of the employees and public.

Build Morale and Stimulate Co-operation

Stresses the value of slogans and suggestion boxes

By H. W. Stowell,

Albuquerque, N. Mex.

Previous efforts to improve morale have been rather half-hearted in the shops and roundhouses. In times past the master mechanic would call the boys together for a pep talk and they would sing one verse of "America." One cold night in the drop pit the boss passed cigars. These were obviously gestures to build up morale. The whole background of each individual has an effect on morale. It is built up by propaganda.

Working with the Men

Workers think they have but a small stake in the enterprise they are engaged in and no voice in management and laying down policies. Shop council meetings, where shop problems are freely discussed by workmen and officials, give workmen a sense of importance and make them feel that they have a real part in activities. Cooperation is the thing and radical union organizers find tough sledding "organizing" a plant where every man talks freely with the superintendent and where grievances are aired at regular council meetings. In such a shop the foremen are more apt to be found working with the men than bossing them. Unfortunately such conditions are not universal and were unknown 25 years ago. In this day when psychologists have investigated every activity of the human mind, one would suppose that this intangible factor in success (morale) would be blueprinted, but it is too elusive.

A Slogan Needed

In large undertakings it is necessary to have proven loyal supporters of the management at key points. These men should know their stuff! Born leaders have the gift of building up the morale of their men. The daily wage and inherent ambition of the workers causes them to do

their job well, but more than this is needed in emergency. What we are trying to do should be clearly established and given a slogan and a symbol. Germany has "Heil Hitler" and the well known sign. A suitable motto for the railroad shop is hard to find. It should ring true. Railroad slogans are already plentiful like "Friendliness is a Tradition," and "The Old Reliable." A really good one that will crystalize our aims and appeal to popular imagination may elude search. "Uncle wants his boats" is the excellent slogan of the Manitowoc shipbuilding company, on the Great Lakes.

The controlling factors of public opinion are not seen on the surface. Indifference and antagonism may be founded in some disagreeable background experience that cannot be traced. If the superintendent or master mechanic would write a letter, or even a form letter, to each employee occasionally, asking for suggestions to improve efficiency, etc., and apparently take the workman into his confidence, morale would be higher. He might also know something about the families and personal interests of the men and inquire about their children, etc., in passing through the shop.

Practical Value of Morale

The following story shows how morale upset an experiment arranged to test the effect of good and bad working conditions. One of the large electric companies wished to determine the effect of proper lighting on shop output. It selected four of its best girl workers for the test and let these pick out two more. They were told that some important test work was being done and for them to do the best they could on their customary job of assembling some tricky electric apparatus. The output under the best possible shop lighting conditions was noted, also the output under poor light and very poor light. To the surprise of all, every time conditions changed the output slightly increased. The explanation was that the morale of the group was high and they were making special effort to do the best they could.

Building up morale is a swift and sure way to increase output and one that has great possibilities for important results without introducing new systems or spending money. It is the state of mind of an organization, difficult to define, but concerns loyalty, cheerfulness, tenacity, initiative, and enthusiasm. It is an intangible factor about three times more important than working conditions or the supply of tools and material. Favorable working conditions, including proper food, shelter, and entertainment, improve this mysterious something that armies fight on and workers work on.

The problem of how to build up morale by propaganda is a problem in applied psychology, a subject that railroad shopmen and other people know little about. Men react to what they believe to be true. Any effective propaganda must hook up with the emotional opinions men already possess. Psychologists call an established set of beliefs a stereotype. Man has no true picture of the world in which he lives but an imaginary picture he constructs in his mind to please himself. In other words a stereotype is knowledge we think we have and on which we base our behavior. People have a tendency to cling to their established beliefs and opinions and the effective propagandist takes this into account and directs his barrage of propaganda to arouse some attitude already dominant in the group.

Before 1922 the railroads did not pay much attention to influencing public opinion, or employees opinion either, and probably the best known railroad slogan was the remark, ascribed to Wm. H. Vanderbilt's: "The public be damned," which would not have been known except for newspaper publicity. Union propaganda had cost the railroads a lot of money and some counter-propaganda was necessary to build up a loyal organization. The company union was a good answer to union propaganda. Some examples of large scale propaganda are in order. The long range campaign of the public utilities companies is a well known example. These companies gave books to the schools, invited student groups to visit their plants and spread all sorts of veiled propaganda against public ownership of utilities. It was even suggested that the word "profit" not be used in connection with their business because "in the true sense public utilities make no profit." It worked and the United States is about the only large country where the utilities are not government operated.

More About Slogans

"Slogans are both exciting and comforting, but they are also powerful opiates for the conscience. Some of mankind's most terrible misdeeds have been committed under the spell of certain magic words or phrases." (J. B. Conant, Baccalaureate address, Harvard, '34). The word means literally "army call" and was the war cry of a Scotch Highland clan. "Keep 'em rolling to keep 'em flying" would not be bad for railroaders.

We need the help of magic words and phrases to help us over the tough spot in which we find ourselves. We do not know the magnitude of the task ahead but it will be greater than any previously undertaken. Glittering generalities like "Make the world safe for democracy" will not fill the bill. Too often we have been misled and found out too late that "it" was all a fake.

Now for a few suggestions that will help morale in the shop: The workman's name and occupation should be placed on a good sized, carefully framed, sign over his machine or bench. This not only helps everyone to know who is who but appeals to the worker's pride and even influences the quantity and quality of his work. The term "common laborer" or "common helper" should not be used. Nobody likes to be common.

Use a Suggestion Box

A suggestion box should be placed near the time clock where written ideas for improving shop practice may be presented direct to the master mechanic or superintendent in writing. If adopted, ideas presented in this manner should be paid for. This suggestion box method has been thoroughly tried out by large factories and it works. Even if no valuable suggestions are received it will interest the employee in his job and will help the management to know what is going on by indirectly presenting information that could be obtained in no other way. General Electric Company paid $1200 for one suggestion from an employee and another worker had 54 suggestions out of 78 put in actual use. An insubordinate employee was responsible for General Electric's suggestion box. He put a gadget on a machine during the boss' absence and was fired for it. Later he explained the merits of his invention to the boss' boss and was reinstated and the suggestion box was placed in the shop.

Here is a typical example of an employee suggestion that was a time saver in the railroad shop: A large furnace was being used to melt the lead from scrap driving wheels (an important reclamation operation at this time). The lead ran into molds placed in the bottom of the furnace and it was customary to make one melt each day and then let the whole furnace cool over night before entering it and removing the lead. An employee suggested turning a water hose in the hot furnace to cool it in a hurry. The large amount of heat absorbed by the water in flashing to steam cooled the lead in a jiffy and

it was possible to make four melts a day instead of one, thus increasing the output of the furnace and making more lead available when needed in a hurry. The man that did this said he got the idea from a book, Steaming Up, and that tells the story of Samuel B. Vauclain of the Baldwin Locomotive Works. In his early days Mr. Vauclain was asked to reline an annealing furnace in a hurry. He did it by cooling down the hot furnace with a water hose. Here is a suggestion within a suggestion that suggests that many good shop kinks are embalmed in the printed word and by reading the trade journals and literature of various trades ideas will be found that will be time savers in a new synthesis.

The suggestion box will improve morale because it appeals to the worker's pride and increases his interest because he sees that his cooperation and ideas are wanted.

Suggestions from Employees

Ideas can be developed and drawn out by the proper approach

By Robert H. Carlson,

Minneapolis, Minn.

For this supreme effort there is no panacea. No individual, board or committee, regardless of rank or training, could properly attempt a solution of all problems peculiar to this task envolving the utmost increase in efficiency during a period of restriction and elimination of many things heretofore deemed essential to the successful operation of a railroad. It will require a wholehearted coordination of the abilities and ingenuities of the entire personnel, from the chief executive to the laborer.

In arranging a program of approach to this problem, let us consider as the greatest untapped potential source of informative ideas and practical information, the employees of this great industry, particularly those in or related to the mechanical department—not that they are smarter than their officers, but there are so many more of them. They are in more intimate contact with and are using the equipment, appliances and supplies. Most of them have accumulated years of experience in their respective departments and individual duties, which should particularly adapt them for this effort.

The executive, regardless of his practical knowledge, cannot through personal observation be aware of all details relative to individual units or operations within his jurisdiction. His time is almost entirely devoted to administrative duties and such occasional inspection tours as time will permit. The junior officer likewise loses that intimate contact, as his supervisory duties are broadened.

If, however, each employee could make one practical suggestion effecting a short cut in operations, a saving in materials, supplies or operating costs, or an improvement in the service, the aggregate result would be astonishing.

Of course, such 100 per cent results cannot be attained, due to duplication of ideas, lack of ingenuity and, in some instances, lack of interest. Yet an approach that offers to the employee a means of cooperation in this emergency, without the complications incidental to participation in open meeting discussions, complex letter writing or asking supervisors to convey his ideas to higher authorities, should be acceptable to all and effect the utmost response and enthusiasm.

Why Suggestion Plans Fail

The methods of the past in such campaigns were usually none too fruitful, due in part to reluctance of employee to attempt individually anything that might cause him personal embarrassment, regardless of the merit of his endeavors.

Requests for suggestions from employees were usually more or less routine and alike, sometimes dressed up a little different, but to the man in overalls the same old thing, nevertheless. In fact, most "Boomers" soon learned just what to expect in that direction wherever they worked—usually "bulletins" asking cooperation, welcoming suggestions or announcing meetings wherein employees could offer suggestions, et cetera.

The reception and effectiveness of this approach has usually been of doubtful value to either employer or employee. The seasoned officer or supervisor often has a very tepid personal reaction to this procedure, yet it looks well and indicates to superior officers an effort in the right direction. It is usually soon forgotten, until another campaign is deemed necessary.

Many of the most able and efficient workers in and related to the mechanical department would rather labor in overalls than attempt the composition of a letter that could properly describe improvements or economies that might come to their attention. Likewise, if called upon at a meeting, they would be mute, not because they were dumb or ignorant, but for lack of experience in things that are not a part of their usual vocation. Neither do they relish an approach to busy officers who might be impatient or difficult to see. So, regardless of good intent, it is usually easier to do nothing about it, and thus ideas which may have much merit if applied in practice are lost, unless the employee can persuade his supervisor to handle the matter for him. Often a supervisor is likewise afflicted, as he is but a step above his subordinates. He too may dislike staff meetings and therein be mute, or evade writing letters that vary from routine correspondence and which perhaps might include somewhat complex sketches or descriptions. So what seems to the executive a simple, reasonable and friendly request, may be to the employee, a "headache," if he attempts such cooperation.

The message or correspondence from the executive finds its way to the employees without difficulty, but delivering the response, is to many employees, an overwhelming task, due to complications not apparent to the officer.

Employees Will Respond

But there is a solution. Employees will respond if a real desire for their cooperation is sought, and the executive, preferably of highest rank, who is best able to enforce such mandates, will establish a fair and effective system of rules for collection of such data and an impartial and reasonable method for elimination of the impractical.

The employee who submits such material should be

privileged to know the eventual disposition of his contribution, and if merited, some appreciation should be indicated by a written acknowledgment and an insertion in personal record files, if such are maintained.

If the suggested improvement is complex or particularly related to such employee's duties or working equipment, he should be consulted in the application thereof, inasmuch as there is possibility of distortion in the transmission of ideas, that could affect the practicability and effectiveness of such improvement.

The executive and engineering staffs, normally, almost exclusively initiate and apply such changes or improvements as are deemed essential for economy or better service, this being their obligation and past results speak well for their efforts. It is assumed that this group will continue, as in the past, to devote every effort toward that end. Having engineers, draftsmen and necessary facilities available to them, together with well established sources of information and many agencies for exchange of modern ideas, it will properly be their responsibility to appraise or revise and arrange for prompt application of material accepted as essential in this emergency.

The plan suggested is somewhat a reversal of the standardized procedure wherein the executive indicates a willingness to receive suggestions and the employee must assume the entire initiative in reciprocation.

Suggested Procedure

The executive inaugurating such program should expect without reservation the full, friendly and continuous cooperation of all subordinate officers and supervisors, in the assemblage of such data and the furtherance of this campaign. Every employee should be considered a prospective participant in this effort.

It should be the duty of the supervisor to seek by personal contact, the cooperation of the more reticent or too modest employee.

If local conditions indicate that better results might be achieved through efforts of a committee selected by employees to work in harmony with officers to that end, such committee should be afforded every essential assistance.

Make it a live, interesting and educational, patriotic service!

A standard printed or mimeographed form should be available to employees for description of the contribution, with provision for necessary accompanying data, such as name, occupation and location, also name of officer receiving it.

The employee should receive an acknowledgment from the officer accepting it.

All concerned should avoid preparation or acceptance of material reflecting adversely on other employees, or such as could be construed as unethical or derogatory to this effort.

Information that would merit general application for maximum utility should be available to all carriers. It is suggested that some active agency be established for this purpose.

Promote Safety

Suggestions to promote safety are of utmost importance to the mechanical department, inasmuch as trained and skilled workers are difficult to replace and an injury to an employee may seriously hamper operations.

Speed with safety should be the aim.

Elimination of waste can be accomplished with a general improvement in related operations and much saving in time and expense. It should be a pleasant effort.

Utilize American Inventiveness

Proposes that best practices from local suggestion boxes be pooled by all railroads

By John F. Todd,

Machinist, C. & O., Lexington, Ky.

Many years ago, when I was a youngster at the trade, an older machinist told me this: "If you would show an English machinist how to do a certain job, then come back to that shop twenty years later, you will find him doing it just as you told him. But if you told an American machinist how to do a certain job he would try to improve on it the next day." That is characteristic of the American people in general, and the American machinist in particular. We are an inventive people, we are constantly striving to do things better than they were before. This applies to the railroad mechanic more than anyone else. Not one of us but has at one time or another made up gadgets and jigs to lighten manual labor and simplify complicated processes in the building and repair of locomotives and cars. We see that a thing should be done a better way and we proceed to find out that way.

But it is more often true than not that this inventiveness on the part of mechanics is used only locally, each one's idea of betterment in shop practice not going beyond the local shop. In this national emergency when such a heavy burden rests on the rolling stock of the railroads we need all of our skill and ingenuity to keep the big machines going. The daily mileage of locomotives has increased greatly in the last several months and will increase more in the months to come. In servicing this power more care and watchfulness will be needed on the part of running-repair men. This is the time to pool our brains and inventiveness for the use, not only locally, but for the benefit of all railroads.

I would suggest that it could be done this way. Let each employee be urged to make suggestions to the management of each shop or plant of better ways and methods in upkeep and repair of locomotives and cars. There are many ways in which running-repair men and mechanics generally can find savings in material and labor, as well as improved methods in the upkeep of locomotives. Then the suggested improvements could be passed on to the chief mechanical officer of the railroad, there to be examined in consultation with mechan-

ics who have had years of experience and skill, able to judge of the practicability of the idea suggested. They could then be sent out to all the shops on the road. Of course what could be used to advantage in a small shop might not suit in a larger one, and vice versa. But out of the many suggestions some at least would be useful in most shops and roundhouses. The important thing is to keep locomotives going.

Also there should be a central bureau where these improvement ideas could be sent from each railroad and from this place made available for use on all the roads of the country. I would suggest that some publication devoted to the interests of mechanics on the railroads would be the proper agency to act as a central bureau. If you've got a good thing let others know about it in this time of National Defense.

The Supervisor's Responsibility

The men will respond better if they understand the "why"

By C. E. Fairburn,

Gang Foreman, C. & O., Huntington, W. Va.

One of our Class I Railroad presidents complimented the officers and men for a job well-done in handling the greatest amount of business in one month in the history of that railroad. This accomplishment was only possible through the splendid co-operation between the workmen and management.

This is not enough. Each day that passes, material and man-hours are less, and harder to get. This places the responsibility squarely upon the shoulders of supervision. They must throw off the shackles of revenge, selfishness, or indifference, and work as one unit to save material and man-hours.

The supervisors, wherever they may be, in back shop, roundhouse, or store department, must work closer together to accomplish this task. The workmen must be taught to use only the material that is actually needed for the job and not new material where it is possible to repair or salvage the old parts; and to take care of machines, tools, or equipment entrusted to him.

It is said that a foreman must be a diplomat; he must be tactful. Men do not respond and give their best efforts when simply receiving curt orders. They want to know why they must do things in a different way from that to which they have been accustomed. They like to know the reason for changed plans or new methods. If they understand what you want, they will take a much keener interest in their job, will do a better day's work and will be happier than if they are just mechanically doing their part in a series of operations. The mind of man working alone has accomplished many marvelous achievements, but the minds and hearts of many, working in harmony with one another for the mutual benefit of all, have a wealth of power that can be a valuable asset to any organization.

Build Up the Morale

Encourage suggestions from employees; use forums and discussion groups

By H. H. Andresen,

Draftsman, C. B. & Q., Chicago, Ill.

To meet today's war time production demands upon railroad car and locomotive shops a certain intangible force is of supreme importance. That force is the morale, spirit and enthusiasm of the railroad shop's personnel. Despite the importance and indispensability of railroad service to agriculture, industry, and commerce, and because of the inroads upon the railroads' field of service by trucks, buses, pipe lines, waterways and aeroplanes, and the foreboding prediction regarding the future of the railroads constantly appearing in newspapers and magazines, many railroad employees have become discouraged and disheartened; they have come to feel that railroads are a sick and dying institution and as a result the morale, spirit and enthusiasm of railroad employees is steadily declining.

Nothing will more speedily and effectively increase the overall productivity of railroad car and locomotive shops than the reversal of this decline and the raising of the morale of the railroad shop employees. To accomplish this two suggestions are offered.

Install Employee Suggestion Plan

Install an employee suggestion plan, through which employees may submit suggestions for the improvement of production and maintenance methods, materials, and the railroad's service to the public.

Suggestions should be submitted anonymously, identified only by a prescribed duplicate numbered form which must accompany each suggestion. A portion of the form bearing the duplicate number is retained by the author of the suggestion as a means of identification if his suggestion is accepted.

Suggestions should be considered by a qualified and alert committee, and appropriate cash awards granted to the author of acceptable suggestions.

The employee suggestion plan affords an excellent opportunity for constructive participation in the affairs of the employing railroad and instills loyalty, interest, and enthusiasm.

Appoint a qualified and able person to promote em-

ployee forums or discussion group meetings to be held periodically, preferably bi-weekly, to debate, study and discuss the many phases of railroad service and its influence upon all people. These discussions might include the railroad's place in the sphere of economics; the advantages and disadvantages and future outlook of the various forms of transportation (railroads, trucks, buses, waterways, pipe lines and air-lines); railroads and the American standard of living; railroads from the investor's viewpoint; railroad securities as insurance company investments; the St. Lawrence Seaway; railroad progress and further possibilities of improving railroad passenger and freight service.

Lectures and explanatory literature are of limited value as a means of interesting and acquainting railroad employees with the economic aspect of the various forms of present-day transportation service, but a thorough knowledge of the principles of transportation and the ability to transmit this information to relatives, friends, neighbors and business acquaintances may readily be acquired through participation in the informal debates and discussions of railroad employees.

Fundamental Desire for Recognition

It crops out in or lies just below the surface in many of the following comments

The simple but profound desire of all men for human recognition has been evident at many points in the papers which have been presented in full or in abstract. Much the same urge is evident directly or indirectly in some of the following short paragraphs. Some of them also raise pertinent questions with respect to problems of supervision and of shop or enginehouse organization and management.

Training Courses for Mechanics

The government has placed at the disposal of the citizens vocational schools, trade schools, and classes where there are competent instructors. All this is free of charge, and I feel the average railroad shop and engine house mechanic would receive a great deal of benefit for himself and the railroads if they would enroll in one of these schools. I would suggest taking shop mathematics; this knowledge will help them to solve many problems.—*William J. Panek, Machinist, C. St. P. M. & O. Ry., St. Paul, Minnesota*

A Call to Arms

In the present emergency all railroad workers are morally called to support the front line fighting men; to support those who, if necessary, are willing to defend our birthright with their very lives; to support those who have set an example that we must give an "all out effort" to keep up with them. . . . A successful American defense depends upon the individual attitude of all railroad workers. The railway men are called to sharpen an ax toward the climax of the axis.—*Clyde Cahill, Oelwein, Iowa.*

Don't Get the Itch from Criticism

Supervisors in the shops, watch your stripping gangs. We must save and reclaim every piece of material possible. Don't get the itch from criticism,—welcome it. And don't know so much that the laborer cannot point out things to you, for your good as well as the management. Success is sometimes obtained from being a good listener. Don't take all the credit for the pointers given you. Let it be known that "Bill" picked up so and so and passed it on to you. Then other "Bills" will be doing the same for you. Your job will be easier. You will be a success and your company will get the saving. It's all so easy when you have co-operation, and co-operation depends on the supervisors. Another thing, Supervisors, watch the tools the men are working with. Get rid of your old wornout tools. If you give your men good tools to work with, you can demand good efficient work. Wornout tools are a waste of output and when you are not getting the proper output you are wasting money. In the world of dwindling resources —know the value of materials and use them masterfully, neither skimping nor wasting. Personal discipline is the guide to success.—*O. N. Monroe, Car Foreman, Atlantic Coast Line, Rocky Mount, N. C.*

"That Was a Nice Job, Fella"

It's inconceivable how much human relationship is being ignored by both supervisor and laborer because the laborer is driven instead of being induced; there is no one who will say to him, "nice job," or "I like the way you did that" Instead the boss takes on a do-more-next-time attitude, never thinking of the prestige he undoubtedly would have gained had he shown a little appreciation. In my thirteen years of railroading I have only once known of a case where the boss has said to his mechanic, "That was a nice job, fella." I took particular notice of this mechanic to see the results, and believe me when I tell you he certainly did come through with flying colors. The Mechanical Department is on the spot only in that one person is waiting for the other one to co-operate, instead of co-operating himself.—*Clifford F. Connors, Conneaut, Ohio.*

Less Walking and More Work

We should make a change in our method of performing ordinary repairs. First let us understand the ordinary routine of a job. The gang leader gives the machinist a slip noting the repairs to be made. With his helper the man goes to the locomotive with his kit of tools and sizes up the work to be done. In more than forty per cent of the cases all that is necessary is to tighten up a part or apply a standard nut or bolt. The helper starts out for this part, first seeking the foreman to get an order, then he hikes for the storeroom, awaiting his turn, and after considerable time returns to the waiting mechanic. There could easily be arranged between various pits in the enginehouse small supply centers containing nuts, bolts, washers, cotters, etc., and other small supplies generally used that a man may take without the usual long drawn out procedure.—*R. T. Roberts, Albany, N. Y.*

Share Ideas

One big field for improving shop production has hardly been scratched and this is due to the clannishness of the individual railroads. Each railroad and, in some cases, each shop has its own little group of inventors who are always devising new methods and have new ideas on improving the method of handling or improving the equipment itself. Within the individual railroad, master mechanics, general foremen and various shop foremen should be interchanged between shops from time to time to bring in new ideas and keep the supervisory staff alert. Neighboring railroads should contact each other from time to time, and, if possible, make visits and exchange ideas. Competition is the spice of life; but with so much outside competition, the railroads should cling together and lend each other a helping hand as far as possible.—*Eugene W. Preble, Alexandria, Va.*

Mobilize Brain and Ingenuity

A bureau should be established to deal with mechanical problems in the railroad field and its personnel should be recruited from men who have demonstrated their ability to initiate new ideas and to develop and apply the ideas of others. No division of any railroad is without one or more of such men. A group of practical men, selected with care, could accomplish much in developing labor-saving devices and improved methods of performing work. Railroads have not scratched the surface of the potential wealth they now possess in the undeveloped ideas of their employees.—*H. W. Payne, San Bernardino, Calif.*

Up-Grading Shop Employees

The question of labor shortages is most acute because other industries have already employed many of the finished apprentices at more lucrative salaries than those offered by the railroads.

There are many shops who have several young and intelligent helpers on their rosters. As a proposal, perhaps the companies could arrange with the labor organizations, to which most of the men belong, whereby outstanding helpers could be temporarily promoted during the emergency. After the emergency, the men can return to their original status without loss of seniority or standing. It would seem the men involved would welcome the opportunity to earn more money for the duration without running the chance of losing their status afterwards if offered a permanent promotion. Also, outstanding three-year apprentices could be promoted with the understanding their journeyman's card would be revoked if they left the employ of the railroad during the emergency, but if released through no fault of theirs, such as by a reduction in force, their promotions would become permanent.—*L. H. Booth, assistant mechanical inspector, Chesapeake & Ohio, Richmond, Va.*

How Many Men Per Foremen?

Authorities say that a foreman cannot do his job with the greatest efficiency if he has more than twenty-five men to supervise. He must devote a reasonable part of his time to planning his work for best results. Where too much time is required to supervise, planning will necessarily be neglected.—*W. L. Loving, car foreman, Spokane, Portland & Seattle, Vancouver, Wash.*

* * *

More Intensive

Use of Car-Repair Facilities

IN addition to the second prize article, there were six entries in the competition which deal with various aspects of car performance or car repairs. One of the writers presents in detail his argument in favor of a change in the flange thickness of the multiple-wear wrought-steel wheels. Another thinks that three-trick operation of car-repair shops would effect a definite improvement in the efficiency of freight-car operation partly by bringing indoors a considerable amount of work now done on the outside repair tracks where neither the quality of the work nor the effective use of man hours can compare with that obtained inside. There is also one short, but

Work shops 24 hours and bring more work under cover —Can the multiple-wear steel wheel be improved?

pertinent comment on the problem of dealing with hot boxes. A thoughtful consideration of the questions asked by one entrant may well lead to the smoothing up of the rough spots in more than one organization.

Multiple and Two-Wear Wrought Steel Wheels

Service life may be extended by increasing the original flange thickness 7/32 in.*

By J. B. Roman,

Pattern Supervisor, Chesapeake & Ohio, Richmond, Va.

It is common knowledge among railroad men that the cost of wheels for rolling stock, coupled with the labor of handling them, is one of the greatest if not the greatest item of expense to be carried by the railroads in the field of equipment and material. Therefore if some saving could be derived on each wheel that is placed in service or a great proportion of them, considering the large number of wheels which must be replaced each year or originally applied to new equipment, the resultant economy would be a substantial amount.

At the present time several types of wheels are used, cast iron, cast steel which are classed as one-wear and multiple-wear, and wrought steel which are classed as one-wear, two-wear and multiple-wear. Each type and class of wheel has certain specific and inherent good qualities which are the factors upon which their selection is based. These qualities at present balance each other so neatly that it has not been definitely proved that one type should be universally used and the remainder eliminated. Thus the railroads are confronted with the task of improving an individual type or class, perhaps taking a satisfactory quality found in one class and transferring it to another.

From a study of wheel service, it has been found that flange wear is a paramount cause of multiple-wear wrought-steel wheel removal. The multiple-wear and two-wear wrought-steel wheels have a flange thickness of $1\frac{5}{32}$ in. when new and a condemning limit of $\frac{15}{16}$ in. thickness, a thickness wear range of $\frac{7}{32}$ in. The one-wear wrought steel wheel has a flange thickness of $1\frac{3}{8}$ in. when new and a condemning limit of $\frac{15}{16}$ in., a condemning limit which is identical with the multiple-wear and two-wear wrought-steel wheels, a thickness wear-range of $\frac{7}{16}$ in. or $\frac{14}{32}$ in. Thus the one-wear wrought-steel wheel has a decided advantage for longer life in its usual one cycle of life due to the thicker flange which it has when new than the multiple-wear wrought-steel has in any one of the three to four cycles of wear during its life. The thickness of the flange wearing metal of the one-wear wrought-steel wheel is exactly double that of the multiple-wear and two-wear wrought-steel wheels, or 100 per cent greater, which is an obvious reason why the life cycle of the one-wear wrought steel wheel is considerably longer than any single cycle of wear of the multiple wear wrought-steel wheel.

Increased Flange Thickness Not Held After First Wear

In the above, the aim has been to bring out the fact that a thicker flange is advocated for the multiple and two-wear wrought steel wheels at their initial application, that is, the wheels should be rolled with a thicker flange when new so that they can be turned with the desired thicker flange. The point is now stressed that the thicker flange is desirable only at the original application of the wheels, as an attempt to hold to the thicker flange at first removal and throughout the life of the wheel would result in the waste or loss of service metal from the tread of the wheel when turning to restore the wheel contour. When the wheels require turning, the railroads should revert to the present standard flange and tread contour for multiple wear and two-wear wrought-steel wheels.

How will the design of the wheel change and what effect will this change have in mounting the wheels, are questions which naturally follow? As the wheels are

* This proposal is not new and has been considered by the A. A. R. Mechanical Division, Wheel Committee, on numerous occasions in the past. The possibility in some instances of turning one-wear wrought-steel wheels with increased flange thickness to the multiple-wear contour and thus securing further service life is mentioned in the 1941 report of the committee. Regardless of the practicability of Mr. Roman's suggestion, it is obvious that any attendant economies will not be immediately or quickly available.—Editor.

to be machined to the present standard contour at their first removal from under equipment, the least difficulty from all standpoints would result if the additional metal thickness were added to the wearing face of the flange; thus the present mounting gage would continue to be used for gaging the location of the wheels on the axle with the exception of the original application which would require that they be mounted to the inside gage limits plus $\frac{1}{8}$ in. in a manner similar to mounting wrought-steel wheels with worn flanges. As it would be necessary to depend entirely on the inside legs of the present gage in mounting, it is recommended that a new mounting gage be used for the thicker flange, as it is justified by the economy in view.

In turning the tread and flange contour for the original application, it is also recommended using the $\frac{3}{4}$-in. throat radius as in the one-wear wrought-steel wheel

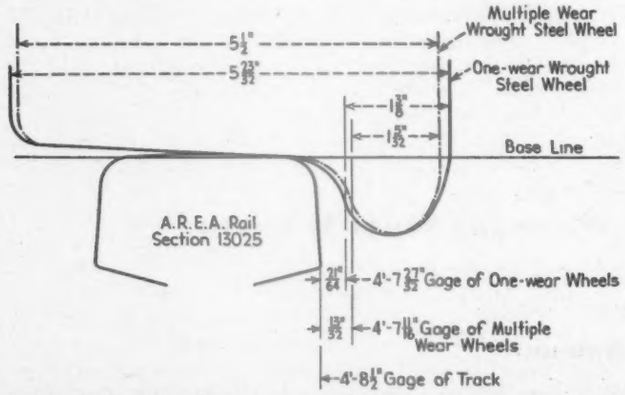


Fig. 1—Position of multiple-wear wrought steel and one-wear wrought steel wheels with standard contour mounted to standard gage on rail

instead of the $1\frac{1}{16}$-in. throat radius, as it has been noted in a study of flange wear that the ratio of flange wear to tread wear is greatly increased after the flange has only a few sixty-fourths of wear. This is due to the fact that the flange first wears almost purely from rolling friction on straight track which later develops into sliding friction as the throat radius becomes smaller

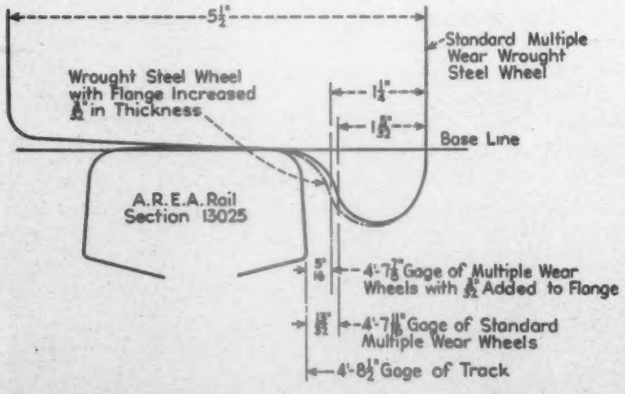


Fig. 2—Position on rail of standard multiple-wear wrought steel wheel mounted to gage and same wheel with 3/32-in. of metal added to face of flange

and the flange begins to rub against the rail instead of rolling over it. Therefore, the $\frac{3}{4}$-in. radius being larger, rolling friction will exist for a longer period of time and greater life will be given the flange and consequently the tread wear and flange wear will have a better opportunity to balance each other.

In Fig. 1 is shown the position of a multiple-wear wrought-steel wheel and a one-wear wrought-steel wheel both with present standard contour on an A. R. E. A. rail, section 13025, when mounted to standard gage.

In Fig. 2 is shown the position on the rail of a multiple-wear wrought-steel wheel with present standard contour and a multiple-wear wrought-steel wheel with the flange increased $\frac{3}{32}$ in. in thickness at the wearing face when mounted to inside standard gage. This makes the distance between the gaging points on the face of the flange just $\frac{1}{32}$ in. greater than the 4 ft.-$7\frac{27}{32}$ in.

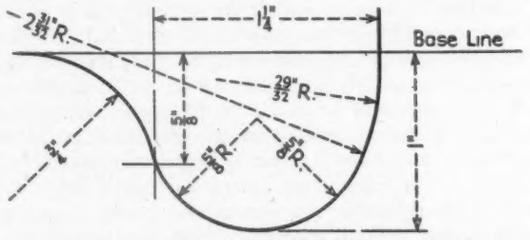


Fig. 3—Detail of flange increased 3/32 in. in thickness

distance now used for the one-wear wrought-steel wheel. This is the immediate change advocated in the flange thickness and it would not alter in any way the present relation of the multiple-wear wrought-steel wheel gaging when the railroads revert to the present wheel contour at the first turning. Fig. 3 shows the detail of the new flange contour. This does not call for much change in the manufacturer's rolling equipment.

Flange Thickness Increase of $\frac{7}{32}$ In. Considered Most Desirable

To increase the multiple-wear wrought-steel wheel flange $\frac{7}{32}$ in. in thickness to be equal to the flange thickness of the one-wear wrought-steel steel, and thus

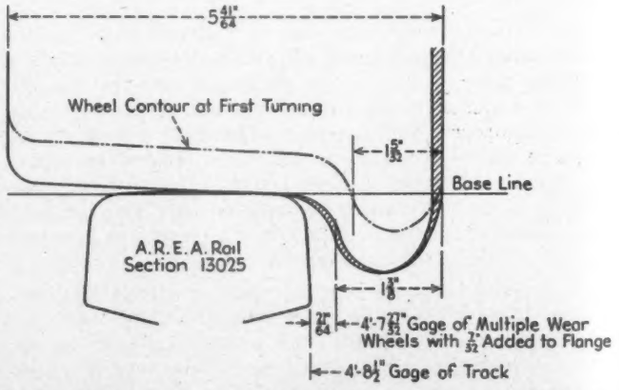


Fig. 4—Position on rail of multiple-wear wrought steel wheel with metal added to face of flange and back of flange and rim to obtain 7/32 in. increase in flange thickness

gain considerably more service in its initial cycle of life, involves more changes than the changes recommended above.

Taking a long view of the situation, with due consideration given to the change required in rolling equipment and the gaging of the wheels, it is the author's firm conviction that in the final analysis the $\frac{7}{32}$-in. increase in flange thickness is the most desirable and will produce the greatest economical results. Above there was added $\frac{3}{32}$ in. to the wearing face of the flange, but in order to get a total of $\frac{7}{32}$ in. increase in flange thickness, it is recommended using the same flange contour as that now used for the one-wear wrought-steel wheel which will add $\frac{5}{64}$ in. to the face of the flange of the standard multiple-wear wrought-steel wheel and $\frac{9}{64}$ in. to the back of the flange and rim. The wheels are then originally mounted to gage with the present one-wear

wrought-steel wheel gage. After the first turning, it will be necessary to use a new mounting gage for gaging the mounting of the wheels with the flanges turned to the present standard contour.

In Fig. 4 is shown the metal added to the present multiple-wear wrought-steel wheel to obtain the $\frac{7}{32}$-in. increase in flange thickness. Note that no metal is added to the front face of the wheel rim. Fig. 4 also shows the contour of the wheel after the first turning, reverting to the present multiple-wear wrought-steel wheel standard flange contour.

Studies of wheel service show that by increasing the life of the wrought-steel wheel flange the life of the wheel is prolonged considerably.

Ask Yourself These Questions

If you cannot answer them satisfactorily, is your car department in good shape?

By Milo Denney,

Interchange Car Inspector, Wabash, Tipton, Mich.

Are all departments working in perfect harmony for the good of the whole, or is each department pulling in a different direction?

Are the men of each craft doing their own work, or horning in on some other craft causing bad conditions and loss of efficiency?

Have you any make-believe car inspectors, who permit cars not fit for loading to be set in at loading docks, thus causing loss of confidence of shippers, expense to the carrier and loss of tonnage going to truck lines.

Is an insufficient number of car inspectors, or lack of proper inspection, especially to foreign equipment, resulting in many running repairs, delays, lost confidence of shippers—possibly heavy car repairs or even train wrecks?

Are foremen cutting off help, trying to impress management that they are extra efficient, and at the same time losing business and causing much additional expense by neglect of equipment?

Are foremen capable of understanding their men and placing them on jobs for which they are best suited, or do they show partiality, hold grudges and cause trouble which leads to labor-board cases?

Do loading-dock foremen at carriers' docks bill out cars carrying low tonnage and improperly loaded?

Are bad-order cars which have been set out repaired at once or are they delayed for days?

Have you sufficient trustworthy car inspectors to guard against any and all possible sabotage, as well as the usual running defects?

Do you always try to prove your point of view and are you always on guard against false economy?

Suggests Car-Repair Work on a 24-Hr. Basis

The author also points out the value of specialist instructors

By L. M. Foley,

Car Inspector, New York, Chicago & St. Louis, Erie, Pa.

May I suggest the advisability of placing our car repair shops on a 24-hr. basis, particularly during the fall and winter months. In nearly all of our American railroad repair yards, we find the shop holding from 16 to 80 cars, varying in size according to the needs and size of the railroads. In addition, we find outside repair yards holding from three to four times as many cars. Consequently considerable repair work has to be done outside in all kinds of weather and it stands to reason that no man can do as much work in freezing and raining weather as could be done under cover. Inasmuch as there will always be considerable light repair work on railroad cars that will have to be done outside, the placing of the shops on a 24-hr. basis which ordinarily are working on an 8-hr. basis, would bring inside a portion of the work done out in the open and I am sure that all car repairmen would rather work inside than outside at night.

If the car shops were placed on a 24-hr. basis it would require approximately one-third the number of tools commonly used by car repairmen. In addition, and possibly even more important, cars would be repaired more quickly, thus helping to relieve any possible car shortage.

A greater amount of work could be accomplished by the man working inside than is done out in the open, particularly in cold weather. Material could be moved to the men more easily; there would be less waste, particularly of lumber; material which is piled alongside of cars in the open yard in rain or snow is more liable to be broken than material under cover.

There is less time lost by men working inside than by the ones who are exposed to the changing winter weather. The car manufacturers who build railroad cars do all their work under cover and have even gone to the expense of renting buildings when the demand warrants it. They say they just cannot afford to build and repair cars outside in the open, so why wouldn't it pay the railroads equally as well to utilize the space that now stands idle 16 hours a day?

Specialists —Within Limits

The use of specialists in a certain line should never be tolerated to the extent that it interferes with the expansion of the work in that craft. Any man not doing a certain line of work in his craft for some time will naturally forget or become rusty. The ever-changing methods and the use of more improved mechanical devices necessitate special supervision in many cases. May I cite two cases where expert supervision has overcome this obstacle.

1. An eastern car manufacturer, building cars for the railroads, has men trained in car building to do nothing else but instruct shop men who do not seem to grasp the easiest and right way to do their work. I have seen men that were very green and clumsy become very good car builders in a short period of time through the efforts of these instructors.

2. I know of a railroad which had a large number of delays to trains a few years ago due to setting out cars which had developed hot boxes. The matter was placed in the hands of a competent man who had made a study of car lubrication. His contacts with all the car forces involved, instructing them as to the proper method of car lubrication and proper use of their tools, has gained for him an enviable record as a lubrication expert.

Other Suggestions

Standardization of Car Repairs Advocated

The standardization of both passenger and freight equipment is largely responsible for railroads of the United States weathering the last depression as well as they did. However, the policy of standardization has gone far enough. There are various kinds of shop facilities for repairing cars. Some are good and others are bad. It is my thought that one of the most practical and economical operations that could be installed on many railroads is a standard method of repairing cars both foreign and system. I am quite aware of the fact that my idea cannot be worked up over night. But it may well be said that rules and regulations of the Association of American Railroads governing repairing and interchanging of cars were not perfected and put into operation over night.—*A. D. Alvord, general car foreman, Illinois Central, New Orleans, La.*

Pooling of Passenger Equipment Suggested

Another important item of railroading, in my opinion, is the handling and pooling of passenger equipment. Cars today are not like they were 20 years ago. Most passenger equipment operating on Class I railroads today are in good condition and do not become deteriorated and worn-out over night. The thought that I have in mind is that more consideration should be given to the pooling of passenger equipment. A check of railroad passenger terminal yards will reveal many lost passenger-car hours due to certain cars being assigned to certain passenger runs which, if properly supervised, could be pooled, and the passenger-car hours saved would be unbelievable. It is true that the handling of repairs and cleaning of passenger cars would have to be speeded up; however, every other item of transportation is being speeded up, and from my knowledge of handling passenger equipment, I know that an enormous amount of money could be saved if close supervision were given to the handling of passenger equipment.—*A. D. Alvord, general car foreman, Illinois Central, New Orleans, La.*

Hot Boxes A Great Cause of Delays

A check of delays to loaded cars indicates that hot boxes are the greatest cause and an investigation has shown that for an eight-month period on 74 per cent of all loaded cars set out for this cause the repack dates were 10 months old or less. Therefore, a system should be inaugurated, first, to see that boxes are properly packed with suitable packing and second, that packing is set up in every journal box on every outgoing car and boxes carefully examined to see there are no defective or spread journal-brass linings, which work should be done after switching has been completed and the cars are ready for train movement. This plan has been tried out with excellent success and if religiously followed will avoid many delays to loaded cars. It will save the tying up of cars for change of wheels due to cut journals and the labor and material expended for this work can be applied to other cars making them available for service without additional manpower or facilities.—*W. F. Crowder, car foreman, Pere Marquette, Muskegon, Mich.*

* * *

Factors Affecting

Locomotive Operation

A challenging question from a locomotive engineman—systematic analysis of engine failures—Some suggestions for facilitating successful locomotive performance on long runs

WHILE the number of contributions dealing directly with locomotive operation are not as numerous as those in some of the other sections in which the competition material has been classified, those received are by no means lacking in interest. Two of them deal directly with the duties of the enginemen. One of these, written by a locomotive engineman, makes a proposal which is a direct challenge to all enginemen. It would, no doubt, be dismissed by them without consideration if it had not been proposed by one from their own ranks.

The engine-failure paper which constitutes the major contribution in this group proposes a comprehensive set of methods for reporting, analyzing and correcting locomotive-part failures. While many of the suggestions are not new, some of them are sufficiently rare in their application to be worthy of most careful attention.

The paper on long runs contains suggestions pertaining to the servicing of locomotives at intermediate terminals which should be read along with Mr. Raymond's paper in the group dealing with the enginehouse; it is evident that the two authors are closely in agreement in their diagnosis of the problem.

How the Engineman Can Help

Demands fuel economy and proper handling—Periodically examine and demote unqualified men

By O. Edgar Allen*

To one who has witnessed the evolution of the railroad industry, it may seem absurd to suggest that further improvement in efficiency of operation may be made in the interest of national defense. To management upon whose shoulders rests the responsibility for such a condition, that suggestion might seem like the biased opinion of some uninformed crank. Yet the possibility does exist, and its value at this time, when the railroads are being called upon to perform even more than in the past, is great enough to warrant any effort.

Fuel Records A Guide

A most important item in the cost of any transportation is fuel for power. Steam is still the most used power on the rails and no machine is so dependent upon its operator for economical operation as the steam locomotive. It is possible for an engineman to get his train over the road day after day without loss of time and still waste fuel in almost unbelievable quantities. When all steam locomotives burned coal and were fired by hand inefficient operators were restricted somewhat by the limits to the ability of a man to shovel enough coal into the firebox. With stokers to handle the coal, or with oil burners, they may waste as much as they wish and the fireman will not complain.

Many enginemen now in service were hired many years ago. If they were required to pass any examination it dealt with the cruder machinery of that day. Some of these men have kept abreast of the development of the power they are operating. Others have not and are operating machines that cost as much as $125,000 about which they understand only the elementary facts. Economy, under the circumstances, is unlikely.

The same fireman worked on alternate days with two different engineers on a train which always had the same engine and the same number of passenger coaches. All conditions were practically identical. By counting the number of shovelsful of coal it was ascertained that one engineer consistently used four tons of coal more than the other in one round trip of 200 miles. Working twenty days per month this man wasted 80 tons of coal, assuming that the better man wasted none. There was no way of measuring the exact amount of wear that was unnecessarily caused by the less skillful man but it must have been in proportion.

Small Losses Add Up

Engines are being operated without proper lubrication and in a manner that reduces their mileage between overhauls tremendously. Unnecessary wear and damage is caused to draft rigging and brakes on cars. Unnecessary stops are being made for fuel and water. Needed minor repairs are being neglected to develop into major operations for the sake of paper records. In the aggregate, these leaks are destroying a tremendous amount of fuel, steel, brass and other materials, are increasing man-hours and are keeping rolling stock out of service and in the repair shop. The cure may only be accomplished by men who have an understanding of men along

* A locomotive engineman in active service.

with their mechanical knowledge. Although there is no panacea that would eliminate all these troubles, there is an individual treatment for each one that will produce results in time.

Periodic Tests for Engineers

This treatment can be administered only by one who understands something of the politics of railroad management and knows why the official responsible has not made the correction. His hands would be more or less tied if he were subordinate to any lesser individual than the superintendent of motive power, and it is possible to imagine situations where even that might be a draw back. He could proceed with this program only under the most favorable conditions.

Under these conditions, the efficiency man should require all engineers to pass an annual or bi-annual examination on machinery and air brakes. This examination should not be given by any official of the division upon which the men are working but preferably by the efficiency man himself, who will need to be fully qualified if he is to follow the remainder of this program. Any employee who does not pass the examination should be permitted a reasonable time to prepare himself and be given another test. If he fails the second time he should be removed from service and given one more chance to qualify. Failing the third time he should be removed from the service permanently or demoted. There is no reason for the railroads to continue to employ such a person in so important a capacity.

Upon ascertaining that all operators possess the theoretical knowledge necessary for skillful work, he should then observe how each one applies it and insist that perfection be achieved. No surgeon ever attained his skill with instruments from books, but rather from observing and from practice under competent direction. Some automobile mechanics are poor drivers, and some men, who know all about locomotive operation and train handling as it appears in the text books, have never learned the practical application of that knowledge. These must be taught the correct way in which to do their work and made to understand that only that way will be acceptable.

Enginehouse Must Cooperate

Each engineman is required to examine his locomotive after every trip and report its condition and the repairs needed. It is easy to understand why a man, who may have been on the road for sixteen hours and who may be cold, hungry, and wet to the skin, might fail to do as thorough a job of this inspection as he should. Sometimes his engine is so loaded with ice and snow that some parts are not visible. Any of these reasons might cause him to overlook defects which if not corrected before the unit is returned to service may result in very serious trouble. The enginehouse foreman should be required personally to inspect, or have a machinist inspect, all incoming locomotives and should be held responsible for the detection and correction of all defects which his equipment will permit. The practice of repairing only what the engineman reports may permit the foreman in some outlying enginehouse to make an excellent record so far as holding down costs in his shop are concerned, but it is an expensive one for the railroad. A slight addition to his force might make possible a large reduction in the one at the backshop where the things he has neglected are being repaired in their more developed condition. An additional material cost of a few hundred dollars might spoil the savings record of the enginehouse and actually save many times that amount for the company.

Without doubt the railroads are considering every possible means of increasing the facilities of their shops. Where new and better tools are available they will be installed. Every effort will be made to make needed repairs quickly and return equipment to service. However the railroad that applies the "ounce of prevention" will find it worth more than the "pound of cure." The one that concentrates much attention upon the elimination of man-failure, especially in its mechanical department, will produce surprising results in keeping its engines and cars rolling.

More Through Locomotive Runs Will Help

Kind of facilities and organization needed for servicing locomotives at intermediate terminals

By Kenneth B. DeCou and Jay DeCou

The physical characteristics of a railroad may be such that, after making a run of only moderate length, locomotives must be changed in order to use power fitted for the character of the work to be done. However, in many parts of the United States, railroads are not seriously confronted with this problem. At the same time many roads are stymied here because they have used limited foresight in preparing their rails, roadbeds, and bridges, where a little planning and small expenditure would remedy the situation.

It is common practice, in freight service, to operate turn-around runs, that is, to time the runs so that return tonnage will be immediately available when the engine reaches the end of the division. This method of operation is practically equivalent to a continuous run over two consecutive divisions.

The longer the run, the greater the need of careful inspection and maintaining the locomotive in first-class condition. This does not mean that the locomotive need be held at the terminals for a longer period of time between trips than when the runs are short; but it does mean that the inspection must be thorough, and that, to obtain the best results, equipment must be provided at terminals for making prompt repairs. The inspecting and servicing of locomotives on through runs is an individual problem that must be solved to fit each case. It will require a great deal of cooperation between the transportation and mechanical departments. The transportation department must consider the situation the shop forces are in and make all possible efforts to give reliable information as to the arrival and progress of all trains far in advance of present customary practice. They must, without reluctance, make all necessary changes in time cards to facilitate a better engine

handling. They should also cooperate with the mechanical departments in asking for such facilities as may be needed to improve any handling of extended locomotive runs. It is also necessary for the engine crews to be able to give reliable information as to the condition of the locomotive. The shop forces will have to have this information from the crews, far enough ahead of time, to cut in another engine if necessary. They must in all cases have advanced information on the conditions of incoming locomotives on through runs, so that they may arrange to have all the requisite tools, men, and equipment ready to make necessary repairs quickly and efficiently.

A plan could be devised wherein all normal servicing could be completed in thirty minutes time when ample arrangements are made for a turn-out spur, on a track used only for through trains; equipped with pit, fuel facilities, water facilities, sanding facilities, and instructions to leave the servicing crew undisturbed to perform their work. The crew might consist of one supervisor, two cellar packers, one man for fuel, water, and sand. For coal burners a fire cleaner would be added. Then of course the advance information from the engine crews will occasionally substantiate the presence of one or more mechanics of some one of the crafts, which will depend on the type of work that must be performed.

Equipment Serviceability Aided By Eliminating Failures

Thorough inspection and analysis of failures improve service—How to systematize the work

By H. P. Hass,

Engineer of Tests, New York, New Haven & Hartford

Because of the shocks and stresses to which steam locomotive parts are subjected in service and the ever increasing speeds and tonnage to still further augment them, it is necessary that everything possible be done to guard against failures. The extent to which we are successful in accomplishing this will have an important bearing upon (1) safety of operation, which comes before everything else; (2) performance, which requires that maximum availability and mileage be obtained from each and every locomotive; and (3) cost, in which are involved standards, methods, practices, material and labor.

Owing to the difficulty of purchasing auxiliaries, devices or equipment of any kind, the greatest use must be made of existing equipment and materials and their maximum efficiency developed with the two-fold object of conservation and the highest degree of reliability.

Design and material have, in general, become well standardized through the efforts of the A. A. R. Committees on Locomotive Construction and Specifications for Materials, and while such work is never completed, great progress has been made in recommending and adopting standards which, if currently carried out, will reduce the possibility of failure.

Inspection and maintenance have not been so well standardized, each road having its own plan of inspection and its own maintenance standards, methods and practices. Since inspection and maintenance play such an important role with respect to road failures, it is desirable that they receive a great deal of thought and study.

One plan of inspection which is unique is to place the inspectors in a separate organization entirely divorced from the maintenance organization and reporting directly to the head of the mechanical department. This is along the lines adopted by industrial companies and obviously has some very good points in its favor. Regardless of the plan, men for the important position of inspector should be very carefully selected and examined to determine how thoroughly they have learned their locomotives.

In order that inspection may be thorough and accurate, sufficient inspectors, well trained, organized and supervised, should be provided and adequate time for inspection permitted. At a busy engine terminal the supervision requires, before anything else, a prompt and accurate condition report of each locomotive so they may decide upon which engines to concentrate their efforts, so that every move may count.

Definite rules and regulations should be adopted for inspection and test at monthly, quarterly and recondition repairs of certain devices and parts which reports indicate are liable to failure or which are not accessible at daily inspection. A separate work report, including the daily work book report, should be used for these periodic inspections and a strict rule made that not less than a stipulated high percentage of the items of work reported shall be performed before the locomotive may be returned to service. This will result in a minimum of daily work items during the ensuing period and better general performance.

Supplementing the regular inspection reports should be those from the road foremen of engines respecting all items noted by them during the operation of the locomotive and which may not be obvious while at the terminal.

With respect to maintenance, the selection and training of the supervision is extremely important. The management should adopt the best possible standards, methods and practices and then much depends upon the ability and alertness of the supervision in knowing and rigidly adhering to them and training their men to perform their duties throughout in a workmanlike manner. It is impossible to over-estimate the value of training and this applies not only to the apprentices and men, but to foremen. The training of the latter in foremanship has been somewhat neglected in favor of production and there is considerable back work to be made up in this direction.

Studying the Problem of Failures

A study of the problem of failures will show that it resolves itself into three important phases: (1) kind and number of failures; (2) analysis; (3) remedial action.

Since the defects which may and do develop on a locomotive in service are almost unbelievable, we must first know the nature and extent of each kind of failure.

Form 1962-A-2

THE NEW YORK, NEW HAVEN AND HARTFORD RAILROAD COMPANY

MECHANICAL DEPARTMENT

MASTER MECHANIC'S REPORT OF MOTIVE POWER FAILURES

NOTE:- This report shall be forwarded to the Gen. Mech. Supt. within 2 days after failure. Send a copy to the Master Mechanic, General Foreman and Foreman Mech. Inspector of Terminal from which locomotive was dispatched.

Dispatched from..... Date of report.....
Failure occurred at..... Date.....
Train No.....Time lost..... Loco. No.....
Engineer.....Fireman..... Gas Car No.....
Loco. maintained at..... Motor Car No.....

1. Failure of locomotive due to.....
2. Cause of failure of part.....
3. What specific details were checked to determine cause?.....
4. What repairs were or will be made to part or device which failed?.....
5. Who investigated this failure?.....Where?.....
6. Does the nature of the defect suggest we inspect other locomotives for the same condition?.....
7. What effect, if any, did the failed part have on any related part?.....
8. Was there evidence of any carelessness or neglect?.....
9. What is the general condition of this locomotive?.....
10. What recommendations have you in the way of design, material, maintenance or inspection to prevent a similar failure?.....

.....
Master Mechanic.

Fig. 1—Standard form for reporting locomotive failures

This information becomes available by adopting the rule that each and every defect which results in a delay to a train shall be investigated and reported upon by the master mechanic. Every possible effort should be made to determine the actual cause. Where there is an effect there must be a cause and on the extent to which inspection and maintenance forces are successful in discovering and treating the cause depends the ability to reduce failures to a minimum.

A standard form should be prepared for reporting

failures and be in the nature of a questionnaire, such as illustrated in Fig. 1. These reports should be thoroughly analyzed as soon as received and any clues or information contained therein used as the basis for systematic checks and investigations to prevent similar failures. The reports should also be currently tabulated by causes of failures so that at any time the extent of trouble may be known and an analysis made to determine whether due to design, material, inspection or maintenance.

The analysis of failures will, undoubtedly, indicate they fall largely into the following classifications: (1) cracked or broken parts; (2) lubrication and heating; (3) steam and leaks; (4) auxiliaries and devices; (5) miscellaneous.

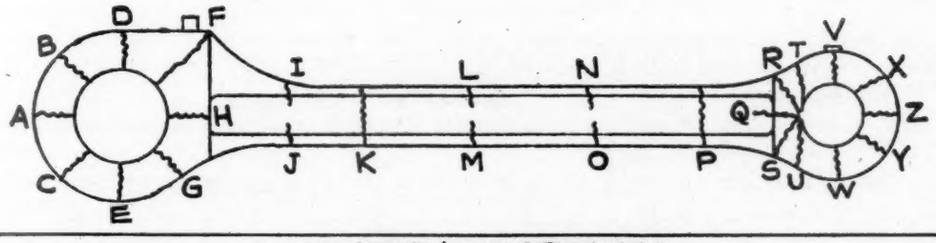
In discussing these classifications, suggestions or recommendations are made not because they are particularly new but on account of their importance. In fact, some of them are quite elementary and they are mentioned simply because failure to consider or constantly check them may very likely result in an increase in failures.

Cracked or Broken Parts

Cracked or broken parts are a continuous source of trouble and expense. In many cases a broken part may cause breakage or injury to related parts and in some instances may strip the entire side of an engine. To begin with, it is important to keep an accurate record of the nature and extent of defects and to accomplish this, standard report forms should be prepared and inspection or maintenance forces required to render a report each week. The form might be in the nature of a defective machinery sheet such as shown in Fig. 3, which has a sketch of each vital part so that it will be easy for the inspector to indicate where the defect existed and answer pertinent questions as to markings, location, size of break and the probable cause. Forms may be letter size and, as indicated, one sheet may, for example, include a sketch of all the vital parts of all the valve gears types on the railroad. The reports should be tabulated as received in the general office and summed up quarterly so that at the expiration of each quarter an analysis may be made.

New York, New Haven and Hartford R. R. Co.

RECORD OF FAILED MAIN RODS – SOLID BACK END



YEAR	LOCATION OF BREAKS																									
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	TOTAL
1938																										
1939																										
1940																										
1941																										
1942																										
1943																										
1944																										
1945																										
1946																										
1947																										
1948																										

Fig. 2—Annual summary of main-rod failures

Form 1990-Q

THE NEW YORK, NEW HAVEN AND HARTFORD RAILROAD COMPANY
MECHANICAL DEPARTMENT

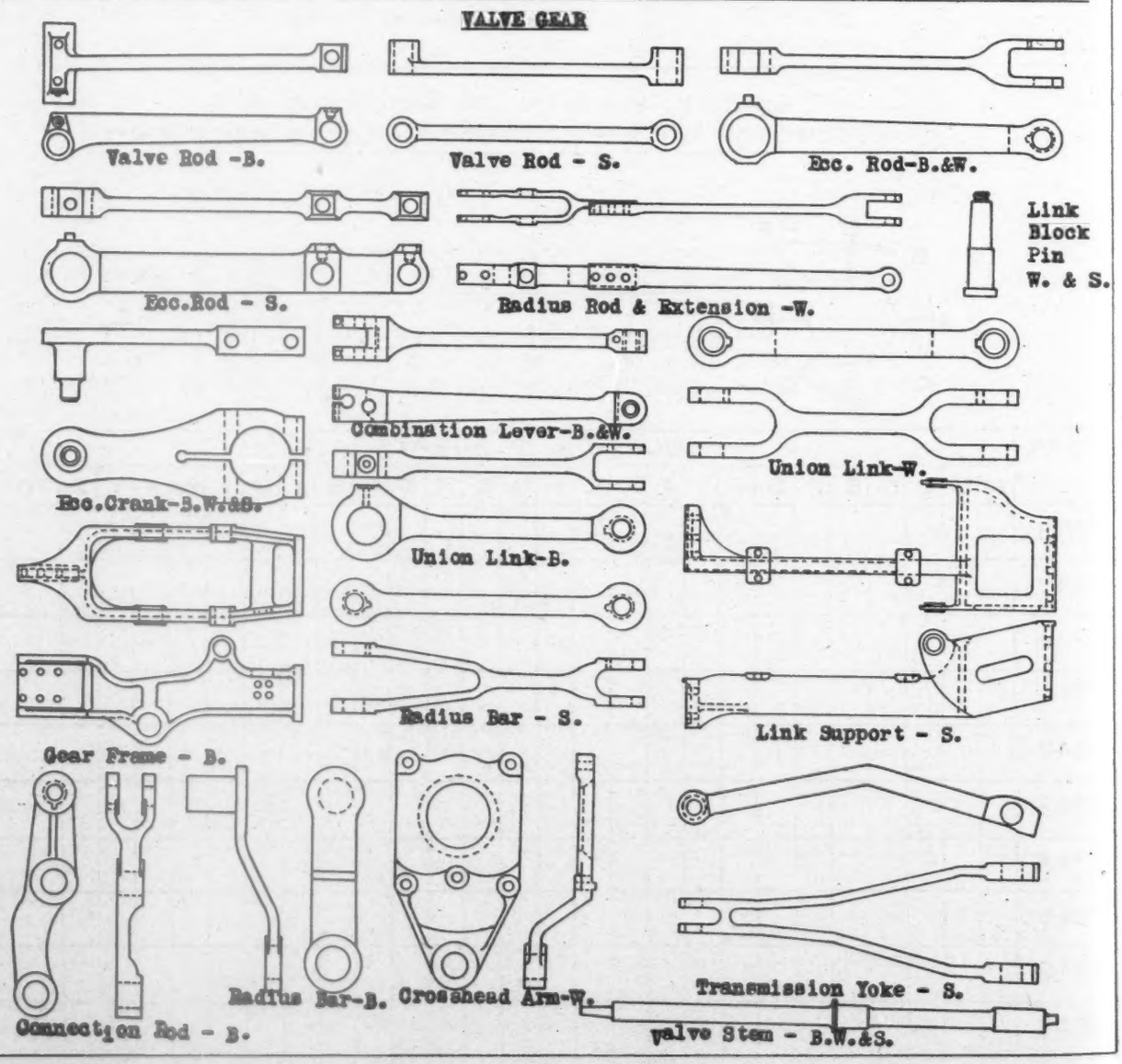
REPORT OF CRACKED OR BROKEN PARTS - STEAM LOCOMOTIVES

Location _____ Loco. No. _____
Name of Part _____ Position _____
Patt. No. _____ Drawing No. _____ Applied at _____ Date _____
Markings _____
Size of Material at Break _____ Size of Break _____
Cause of Break _____

Week Ending Thursday _____

_____
Signature

Note: Read Instructions on opposite side of this form.



Note: (On reverse side of original form): This report shall be rendered each week. Include broken parts which caused a locomotive road failure. Report only one part on a sheet. Do not include parts broken as a result of the failure of another part. Do not include cracked welds. If break is welded for first time and part is to have further service, show by (W). If part is of old or new design, include this on report. In order that the exact location of the break may be determined dimensions shall be given from some definite point on the part to the break. Opposite cause of break, indicate whether it was poor fillet, tool marks, sharp edges, hammer marks or dents, chisel marks, torch marks, improper heating, poor welding, poor material, poor design.

Fig. 3—Sample form for reporting valve-gear defects

To assist in keeping a summary analysis of such parts as are most prone to failure and to provide pertinent information for the mechanical engineer, a form such as shown in Fig. 2, might be adopted.

It has been found that design and material are not generally the answer to cracked or broken parts. If such were the case, we would have a relatively easy solution of the problem. The actual causes are improper workmanship, mechanical abuse and poor maintenance. In other words, it is much more understandable to a design or materials engineer than to maintenance forces, from a laborer up, that steel, under dynamic stress, is like something alive and must be used and handled with great care.

It is apparent that a great deal of training of maintenance forces is required with respect to machining and handling of vital parts in order to provide proper fillets; eliminate tool marks, sharp edges and corners; prevent cuts, bruises, dents, torch marks; heating of parts to handling and transportation of parts to cleaning vats and to and from departments so that cuts, dents, bruises and torch marks may be kept at a minimum.

While the cutting torch is a valuable tool, it is capable of great damage in the hands of inexperienced men. Burning out bolts or bushings often results in gouging a part and starting a crack. Heating parts with a torch to straighten, align or alter its length should positively be prohibited because the flame, being at about 6,000 deg. F., may burn the steel or destroy its proper microstructure.

Preheating of parts prior to welding or building up and all welding practices should be studied. There is much promiscuous use of cutting and welding equipment and it may be advisable to keep such tools in the toolroom to be issued only upon orders of the foreman who should then follow up the use.

Careful consideration should be given to the necessity and extent of machining parts that have been cut out

NEW YORK, NEW HAVEN AND HARTFORD RAILROAD CO.

THOUGHTS FOR PREVENTING CRACKED OR BROKEN EQUIPMENT PARTS

1. **Stop rough machining and poor fillets; remove tool marks, sharp edges and corners.**
2. **Machine out prick-punch marks used in laying out work.**
3. **Apply markings with steel letters and figures at locations where no injury will be done.**
4. **Prevent cuts, bruises, dents and gouges. When they occur, remove with proper stones and buffers.**
5. **Use copper, lead or fibre hammers and sledges. If steel is necessary, use a copper sheet between.**
6. **Provide storage horses or rails for parts and cover the runways with wood, rubber or copper.**
7. **When lifting parts with a crane or hoist, use a hemp rope sling.**
8. **When removing parts from equipment, do not drop them on the floor or upon one another.**
9. **When transporting parts in trays to cleaning vat or Parts Department, separate them with wooden blocks.**
10. **Do not heat important parts with a torch to alter length, straighten or align.**

Fig. 4—Poster used in shops for calling attention to preventative measures

alter, straighten or align; cutting and welding. Ways to accomplish this are the use of lantern slide lectures at shops and terminals showing the effect of abuses; frequent photographic reports of ruined or broken parts, illustrated in Figs. 5 and 6, and prominently displayed; thoughts for reducing cracked or broken parts, shown in Fig. 4, and also prominently displayed in billpost form in the various shop departments from stripping to erection.

Each important part should have every inch of its surface thoroughly explored, using a magnetic tester each time the locomotive goes through the shop for general repairs and each time a part is removed at terminals. At these times it is advisable to recondition parts by removing, with proper stones and buffers, cuts, dents, bruises and gouges so that cracks may not develop therefrom. All time and effort expended in making close inspection and test and reconditioning will pay big dividends by preventing cracks as well as detecting them when in their initial stage so that their further progress may be prevented.

Attention should be given to stripping practices, the by oxygraph. The effect, and depth of the effect, on the steel is considerable and important parts will require machining and careful heat treatment.

At general overhaul, valve-gear and other important parts which show indication of having been heated in an engine terminal to alter length or align, should be thoroughly inspected for cracks and then annealed or reheat treated, depending upon the original specifications.

In the category of improper maintenance may be mentioned poor fits and loose connections which greatly increase the shocks and stresses and general wear and tear of vital parts. Wrist, knuckle and valve-gear pins are chronic offenders in the wear column and being such important connections, perfect pin fits and tight fits of nuts on pins must be currently maintained and an effective method adopted to keep them tight.

To reduce the tendency of failure of axles, crank pins and piston rods, due to stress and corrosion fatigue, the fit should be very smoothly turned or preferably ground and the bore truly round.

The use of a collar on the piston-rod fit does not appear to be good practice. A stress-relief groove in

the neck of the crosshead appears to prevent failure of piston rods.

For tires, maintain wheel centers smooth and as nearly perfectly round as possible. The bore should have a glass-like finish and sharp edges be removed. Band steel should be used for shims where permitted and it is advisable to cut the ends on a bias.

Remove sharp edges from the eyes of rods and from

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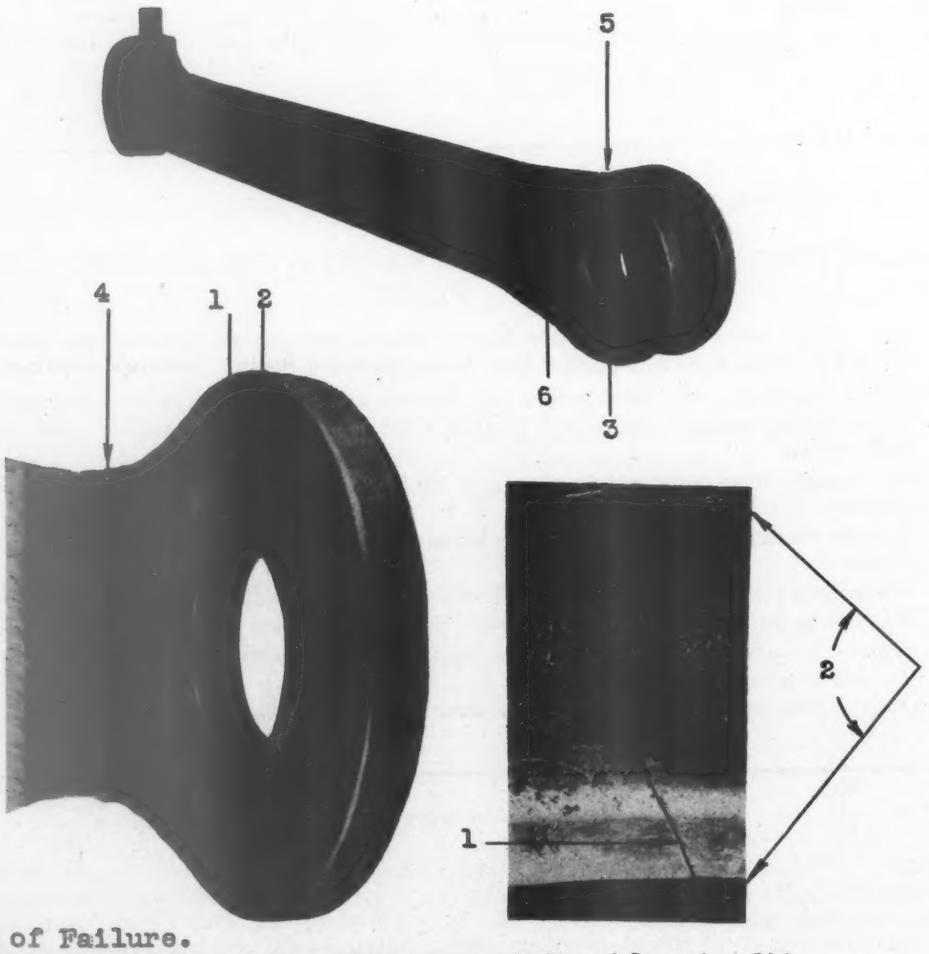
PHOTOGRAPHIC REPORT

CRACKED AND BROKEN STEAM LOCOMOTIVE PARTS

SIDE ROD - LOCO. 1391



A. Cause of Failure.
1. Crack caused by sharp edge worn at knuckle pin fit.

B. Reasons for Wear.
2. Wear from contact with knuckle pin bushing.
3. Loose knuckle pin as indicated by recess made from contact with washer.

C. Additional Defects.
4. Tool marks.
5. Sledge marks.
6. Markings in improper location - See Loco. Folio Sheet No. 23-1.

D. Recommendations.
7. Knuckle pins to be maintained tight at all times.
8. Edges of knuckle pin fit to be rounded off whenever necessary.

Fig. 5—Photographic report of rod crack caused by sharp edge

knuckle-pin holes as they develop; also from grease and spud holes.

Remove sharp edges from wrist-pin holes in crosshead as they develop; also from keyways.

At the larger terminals assign men to the maintenance and setting of shoes and wedges.

To avoid cracks in engine-truck and trailer-wheel hubs, especially the former, due to hub heat, white metal might be used on the box face instead of bronze, since the latter penetrates the steel when hot and reduces its strength.

The various parts of the valve gear are subject to a great deal of breakage. Good pin fits in parts and bushings, low limit of wear, self lubricated bearings, roller bearings, tight fit of nuts and efficient nut fasteners are all essential in reducing these failures.

Some bolts, nuts and connections are very difficult to keep tight and require checking after each trip. For these a high grade bolt or pin material is required to eliminate stretch, and there are several types of fasteners available which are efficient in keeping bolts and nuts tight.

To reduce corrosion and corrosion fatigue of spring leaves, the finished spring should be immersed for several hours in a bath of hot anti-corrosive. This material will penetrate between the leaves, even under the bands, and reduce corrosion as well as provide some lubrication.

Hangers should be checked for cracks and defects. It is advisable to anneal them, especially if they have been chafed and built up.

Broken pipes cause a considerable number of failures. These are usually due to improper threads, poor alignment or poor clamping. Standard gages, rather than fittings, should be provided workmen for threading pipe so there will be a proper fit between pipe and parts or fittings. A definite arrangement of piping should be followed, with perfect alignment so as to remove all strain from joints. Pipe clamps of a good type in sufficient number and properly spaced, will greatly improve conditions. Flexible steel tubing has assisted in reducing certain types of pipe failures.

Periodic inspection of pistons, valves and packing for breakage and wear. Consideration might well be given to the solid lightweight steel piston, also to combination bronze-iron packing rings for both cylinders and valves.

A definite limit of wear should be established for all vital parts and these should be issued in booklet form for the ready reference of all concerned.

Lubrication and Heating Failures

The price of prevention of heating failures and the maximum mileage from bearings is good maintenance and eternal vigilance. Poor finish, improper fit, lack of attention and lubrication and sometimes quality of bearing metal or foreign matter in waste or lubricant are principal factors.

The character of the labor generally used for packing and lubrication is not the highest. It is, therefore, advisable to concentrate as much of the work as possible at one location in the terminal and thus permit of more thorough supervision and assurance that each bearing receives the necessary attention as well as standard methods and practices currently maintained.

Axle and crank-pin bearing surfaces should be very smoothly turned before rolling; otherwise in rolling the tops of deep corrugations this metal is liable to spaul off in service and cause heating.

Axles with collars should have the ends and collars smoothly finished to avoid picking up waste.

The bearing surface of rod bushings should be thoroughly rolled or burnished after smooth boring or turning so as to break in the bearing for immediate service.

For continuous good fit of rod bearings, crank pins should be maintained round and straight, preferably by periodic grinding. Many miles of service are removed from bearings in the boring mill because of out-of-round and tapered pins. Many main-rod bearings are broken in service because of excessive wear. The wear should be determined as accurately as possible by removing crank arms and crank-pin collars at least at 30-day inspection period.

Engine, trailer and tender-truck bearings should have the proper area of contact at crown and be fitted to the axle. They should be removed and inspected periodically in order to determine wear and ascertain that the lining is not loose or cracked. Even though the lining may be tight in a new bearing, dirt may work through the lining to the back and destroy the bond.

The type of casting for rod bearings, i. e., whether sand or chill mold, is important. Tests indicate the chill-mold casting is stronger by virtue of being closer grained and because of freedom from sand is less liable to heating. It appears that if pins are maintained round and straight, materially closer tolerances of bearing diameter to pin may be permitted with consequent increase in bearing mileage.

The selection of the best type of main-rod bearing, i. e., solid, three-piece or split, depending upon rod assembly, together with a minimum number of grease holes in floating bushings consistent with good lubrication, will assist in preventing broken bearings.

The tolerance and clearance of driving-box bearings on the axle is important for adequate lubrication. For these bearings consideration might well be given to the use of oil lubrication instead of grease and thus permit closer tolerances and higher mileage, reduction in pounds, loose bearings, general wear and tear and heating failures.

To keep driving-box face lateral within limits and prevent breakage and loss of the liner, there is a type of floating bronze liner for wheel hubs which gives excellent results.

A detail is the desirability of keeping cellar pin holes round so that the cellar will be always in proper location, and rigid material specifications should be in effect for the cellar pins which take a great deal of punishment in the way of wear and bending.

Force feed lubrication for engine-truck bearing and box faces, trailer-truck and driving-box faces, shoes and wedges and guides will reduce failures of these parts. The use of box type lubricators for engine, trailer and tender-truck boxes, as well as roller bearings has resulted in reduced heating.

Roller bearings on drivers are an important contribution and no doubt their use will be extended. They result in better mechanical conditions throughout the foundation of the locomotive in that they reduce pounds, stresses in pins and rods, wear of rod bushings and tires and increase the availability of the locomotive.

Steam and Leaks

When a locomotive is in the shop for general overhaul a great deal of consideration should be given to the condition of boiler and firebox sheets and parts with the object of avoiding constant repairs in the engine-house, road failures and loss of mileage. Too frequently, parts are allowed to remain in use because they appear to have some additional value rather than to consider that before the locomotive again returns to the shop such parts, if left in, may cause great trouble and expense in constant maintenance.

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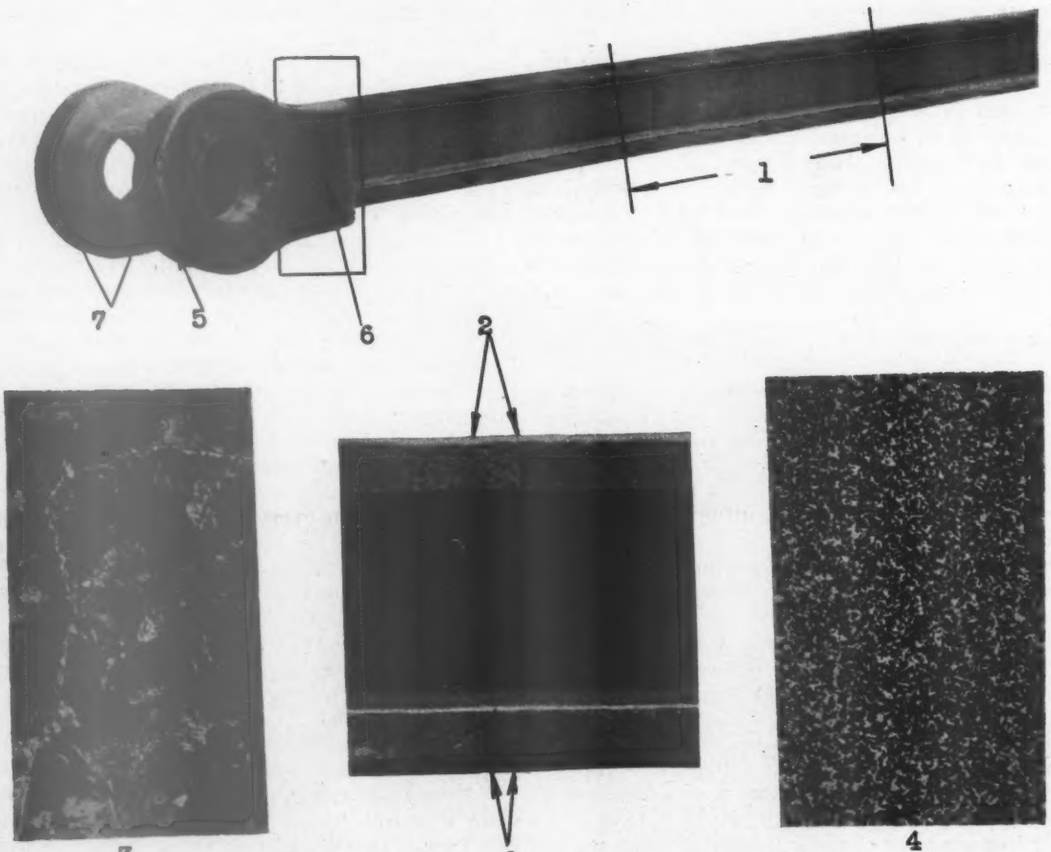
PHOTOGRAPHIC REPORT

CRACKED AND BROKEN STEAM LOCOMOTIVE PARTS

ECCENTRIC ROD - LOCO. 1388



A. Cause of Failure.
   1. Steel overheated when adjusting rod length by a torch.

B. Result of Heating.
   2. Cracks which developed in overheated area.
   3. Microstructure of steel in overheated area; very large grain size.
   4. Normal microstructure of this same steel taken outside of overheated area; very small grain size.

C. Other Defects.
   5. Improper use of sledge hammer.
   6. Many nicks in this area.
   7. Sharp edges.

D. Recommendation.
   8. Close observance of "Ten Thoughts".

The flame of an oxweld torch has a temperature of about 6000°F. The microstructure of tempered steel is completely changed at about 1000°F.

Fig. 6—Photographic report of eccentric rod failure caused by overheating during process of adjusting length

A manual of standard methods and practices with respect to the construction and repair of boilers and appurtenances is desirable and from the standpoints of safety, performance and ultimate cost, it should be rigidly enforced at all times.

Frequent dumping, improper washing practices and rapid firing up of locomotives, impose terrific stresses on boiler, firebox and related parts and cause severe damage to sheets and bolts. A complete record of when and why fires are dumped should be kept currently and a study and analysis made with the object of reducing them to the minimum consistent with the operating conditions and to save fuel. This record will also disclose defects in boiler, firebox, auxiliaries and appurtenances so that prompt action may be taken to prevent or reduce failures.

One source of trouble with firebox sheets is leaks caused by cracks. Since the thickness of firebox sheets must be kept at a minimum, consideration should be given to the best possible steels. Tests have indicated that properly de-oxidized steels and certain types of alloy steels have reduced the tendency to cracking.

Fracture of staybolts is a factor in keeping locomotives out of service. Here again the matter of size is important and the smaller the diameter consistent with necessary strength, the better will be the results. To go along with the higher grades of firebox steels the best possible grade of staybolt material should be adopted.

A great deal of difficulty has been experienced on some classes of power with cinder cutting of flues. The proper grade of steel and an increase in the thickness of safe ends has been found to increase the service. There is a flue being made which incorporates thicker material at the firebox end. If these are not available, thicker material may be ordered in safe ends and one end reamed out slightly to equal more nearly the thickness of the body of the flue and avoid loss of strength at electric welds due to too much difference in gage.

A source of trouble which causes low steam and engine failures is plastered flue sheets. Another is the plugging of flues. For these, consideration might well be given to the use of sized coal rather than run-of-mine. A properly located brick baffle on the arch has also assisted.

Brick arch difficulties may be reduced by thoroughly cementing the brick with a high-grade cement.

Copper ferrules can and do cause poor welding of flues and wherever possible they should be eliminated.

As with the boiler itself, a high standard of repairs is necessary for superheater units, syphons, circulators and other boiler appurtenances. Superheater units will cause a minimum of trouble and expense if they are given a thorough repair when necessary in a properly equipped unit repair shop.

Leaks at pipe joints might be reduced by discontinuing fittings and welding the joints.

Blowing of cylinders and valves has been reduced by using bronze-iron lip-type packing together with a special type of iron for bushings.

Auxiliaries and Devices

Auxiliaries and devices are so tied in with the operation of the locomotive that their failure usually results in a failure of the locomotive. They occur not necessarily because of weakness in design or material but because the device is not always given the required standard of maintenance. Each is a complete machine in itself and is subject to the various ills of the locomotive itself, namely, cracked or broken parts, leaks, lubrication and wear and tear. It, therefore, follows that they should be systematically maintained and to prevent failures it is advisable to adopt much the same general procedure as with the locomotive. At large terminals it is essential to train specific men to make the current maintenance repairs and to become thoroughly acquainted with the device and the work.

The service engineers of equipment manufacturers should be given every opportunity to function at shops and engine terminals and their suggestions and recommendations considered and carried out.

Failures of auxiliaries and devices should be currently tabulated as to nature and cause so that any weakness may be quickly determined and corrective action taken.

Miscellaneous

In this category are road failures that occur so infrequently as not to fall in any special class. However, the aggregate of these failures is large and serious. The best manner in which to attack them is a general high standard of maintenance at overhauls, making doubly certain such parts as are hidden from ordinary inspection receive every attention. Also, the daily and periodic inspection and maintenance should be thorough and complete. Here, again, accurate failure reports and their analysis will prove of value in the endeavor to determine the proper remedial action.

Treatment of Locomotive Boiler Feed Water

Reduce demands for repair materials—Decreased time for flue and boiler work

By W. A. Pownall,

Assistant to superintendent of motive power, Wabash, Decatur, Ill.

The matter of treatment of water for locomotive use may or may not be considered a mechanical department problem but it certainly affects mechanical facilities—locomotives. The treatment of boiler water up to the point where complete results are obtained is offered as a simple means of materially decreasing the consumption of essential materials, and also improving operating practices. Until quite recently railroads have been slow in the development of water treatment, but during the past few years there has been a decided impetus given to the extension of water treatment, and most roads are now using some form of water treatment to reduce scale formation in locomotive boilers. These roads have competent water engineers for directing and supervising the treatment, and the manufacturers of boiler compound have well organized forces of traveling representatives who understand the principles of water treatment and who instruct and supervise the carrying

out of treatment on the roads where they are concerned.

However, the reduction of scale formation is not enough. The status of water treatment has not yet reached the point where scale is wholly prevented, it is merely reduced. The results are only partial, in fact, the results are disproportionately small considering the extent and expense of the treatment. As regards the use of the words "complete treatment" or "elimination of scale formation" we consider these as synonymous with freedom from boiler troubles and minimum expense for boiler maintenance.

Foaming Can Be Overcome

One obstacle in the past to the use of complete water treatment was the failure to understand how to control foaming, and progress was considerably delayed because of this fact. It is now well understood that foaming can be controlled by sufficient and timely use of the blow-off cock, both at terminals and on the road. As important adjuncts we have a device that gives visual indication to the enginemen as to the condition of the water in the boiler and, at the same time, automatically blows off the boiler to prevent foaming; we have the continuous blow-off cock, with which a predetermined amount of water, sufficient to control foaming, is continuously discharged from the boiler. There are well designed blow-off mufflers and separators, and at terminals there are devices used for determining the condition of the water in the locomotive boiler. By proper blowing off, the water in the boiler can be correctly conditioned before the locomotive leaves the engine terminal.

Complete Treatment Gives Results

The art of water treatment for locomotives has now developed to the point where there need be no hesitancy in adopting it completely. Some railroads are using little or no water treatment. Other roads are using water treatment rather extensively, but in some instances treatment is not carried to the point where scale formation in the boiler is eliminated, and the maximum advantages are not being attained. Water treatment should be made complete on all locomotive operating divisions as soon as possible. Present methods of water treatment are well known. They consist of internal treatment with chemicals such as soda ash, sodium aluminate, tannin and some alkaline or caustic sodium salt; boiler compounds alone; boiler compound supplemented by soda ash or sodium aluminate and the lime-soda softener. Since quickly obtainable results are the object under the present emergency situation, the internal treatment seems to offer the best solution. The methods are relatively inexpensive, require simple apparatus for application of treatment, and, at present writing, the treatment materials are available.

Mechanical Benefits

The practice of welding flues to the flue sheet has largely done away with road detentions due to leaky flues. These were prevalent in bad water or untreated water districts before this welding practice was adopted. However, the fact that the flues are not leaking because they are welded to the flue sheet, does not mean that the cause of the trouble has been removed. If the waters are untreated, or only partly treated, the heating surfaces are still more or less covered with scale, with loss of power, loss of fuel and ultimate staybolt and firebox renewals resulting. Where fully treated water is used, the time of a locomotive in the shop or in the enginehouse for boiler washout and boiler work is materially reduced. This is a well known fact, and has been commented on in mechanical papers as a contributory factor in high locomotive mileage. It is also recognized that with proper and complete water treatment, locomotive boilers need be washed only every 30 days, and flues may last between resetting at least the full four-year period permitted by law. Other important operating and economical advantages are well known by mechanical and operating officers.

At one time the writer had occasion to keep records of cost of boiler repairs as compared with total locomotive repairs on various operating divisions, and as an indication of the money savings that could be made, would cite the best treated division where the cost of boiler repairs was nine per cent of the total cost of repairs while on an untreated division with the worst water the cost of boiler repairs was 31 per cent of total locomotive repair costs. Naturally, this difference in boiler repair costs is reflected in a difference in material costs.

Material Savings

The writer does not have information for roads where water is not treated or is only partly treated, concerning renewal of fireboxes, staybolts, consumption of flues, staybolt iron, boiler steel, etc., but the record in the table is offered as representing what is being done on a road where the treatment is complete and excellent results are obtained.

What Complete Water Treatment Accomplished on One Road

New fireboxes per 100 active engines per year	1926-1941	0.4
Previous to use of treated water as high as	.....	12.0
Broken staybolts per active engine per year	1932-1941	1.71

Material Used 1939-1940

Material	Per 1,000 locomotive miles	Per active locomotive per year
Staybolts and staybolt iron, lb.	2.06	79.5
Boiler and firebox steel, lb.	11.47*	432.0*
Number of tubes and flues	0.25	9.54
Tubes and flues, ft.	5.11	197.0

* Part of this material used for liners, shims, and other non-boiler repairs.

These records of material consumption may be used for comparative purposes by roads using untreated water, or where only part of the water supplies are treated, as an indication of the reduction in demands for material that could be made by treating or completing the treatment.

Raw Water Conditions

The raw water supplies are fairly hard waters, such as are ordinarily used through the middle west. All types of water are encountered, those that are low in hardness and where little or no treatment is required, the moderately hard waters of the middle west, the waters that are not only hard, but are also high in foaming salts, and those where sudden fluctuations in mineral content demand constant watchfulness on the part of the water engineers. All can be treated. Some are easy, some are difficult, but in all cases competent supervision is absolutely essential so that treatment is complete and uninterrupted. It may be that some roads using waters of similar quality already make a better performance than indicated above, but it is reasonable to believe that in many instances the consumption of boiler material is much higher; and it is the object of this article to urge the early extension of or adoption of water treatment by any of the convenient means available to improve locomotive operation, reduce operating and repair costs, and to greatly reduce the demands for the now much needed iron and steel.

Cut Down

Engine-Terminal Time

THE major points in the two papers in this section were also suggested in several other contributions, but were much less completely developed in them. Some of these are set forth in the brief paragraphs at the end of this section because of the emphasis they give to the methods proposed in the papers themselves.

The material presented in the following pages suggests that the steam locomotive, insofar as increasing its utilization is concerned, is very much the victim of its own long history. Its disability arises in part from

Suggestions for increasing the number of hours that locomotives are available for service

methods of servicing and making running repairs which are still as deeply ingrained in the fabric of railway operation as was the idea of assigned locomotives a generation ago.

Streamlining the Engine Terminal

"Receiving ward" plan is designed to speed normal daily servicing and repairs

By A. A. Raymond,

Superintendent fuel and locomotive performance, New York Central System, Buffalo, N. Y.

The modern steam locomotive will operate over a long period with a minimum of repairs. How can inspection and repairs be made with the minimum out of service time? It is the purpose here to discuss the active engine; that is, not the handling of engines in the backshop, or for quarterly repairs, but the handling of the thousands of the engines that are arriving daily for fire cleaning, coal and light servicing and which are returned promptly to the operating department for trains. This logically can be divided under two headings.

Facilities are available at many points, perhaps on the main line, where the fires of road locomotives can be cleaned, the engines coaled, watered and greased, and proper inspections made so that the engines may continue through with the trains. But such plants, have not, in general, been installed in yards. With conveniently located facilities in yards, using a small locomotive coaler costing about $1,000 and bucket ash hoist, costing perhaps $1,500, with foundation, etc., costs $10,000, yard engines can be operated 30 days a month, with the crew eating their lunch while the engine is being reconditioned.

What is of perhaps even more importance is the handling of engines that go to the enginehouses. Here engines might be separated into four general classes. (1) those requiring general shopping; (2) those requiring quarterly or periodic reconditioning; (3) those requiring monthly washouts and (4) daily or trip tuning up of locomotives.

The Problem of Increasing Locomotive Utilization

Considering 100 locomotives, it might be estimated that the work listed in the four items above would be required by all of these 100 locomotives during a year's time, approximately as follows:

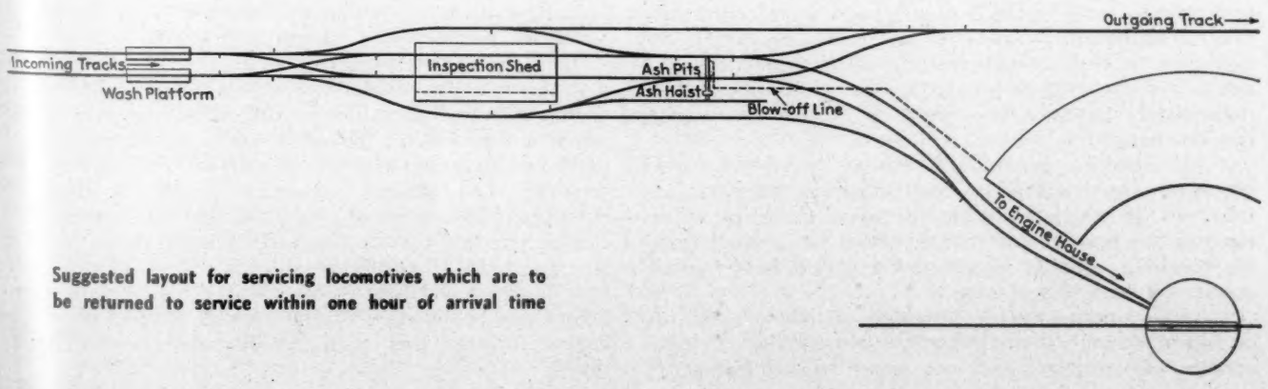
1—Shopped each two years would mean 50 locomotives a year.

2—Quarterly inspection would mean 400 required a year.

3—Monthly inspection would mean 1,200 required a year.

4—Daily inspection, estimated dispatchments 1.2 per locomotive per day, 43,800 per year.

It appears that, with such a large number of daily



Suggested layout for servicing locomotives which are to be returned to service within one hour of arrival time

inspections, the importance of controlling the cost is a major problem. If this work cost, say $7.00 a dispatchment, but can be reduced to $6.10, a saving of almost $40,000 can be made. This saving is an item of major importance, in the average operation of a locomotive terminal.

A second item of perhaps even more importance than the expense at this time is the prompt return of locomotives to service which do not require heavy repairs. The value of 100 modern locomotives, costing approximately $190,000 apiece, is $190,000,000. Suppose that 100 such active locomotives are working 16 hours a day, we have one third of the time idle, or approximately $63,000,000. This would seem to indicate the maximum importance of daily idle time at enginehouses.

If then, the proper war effort is to be made, detailed and definite consideration should be given to an organization of facilities, to reduce idle time and effort to the minimum. For instance, the most important item to prompt handling is that when a locomotive arrives, consideration be given immediately to the work report of the arriving engineman, and that at the same time, a complete inspection of the locomotive be made by the enginehouse mechanics, so that within 20 or 30 minutes of the time that the engineman gets off the engine, the competent foreman will size up its condition and be able to tell his engine dispatcher the time the engine will be ready for use. If only minor adjustments are necessary, the dispatcher can mark the engine up. The fire can then be cleaned and the engine can be coaled and watered while the crew is coming to take her. With proper operation it is believed that the engine will be back in service within an hour after it reaches the terminal.

Inspection Pits Become Repair Points

The importance of moving the machine to the men can be illustrated by the automobile industry, where one man puts one small part on large bodies having the trim applied. It would seem that the man should stick a bundle of these parts in his pocket, walk down the line of bodies and attach this minor item, but it has been found that for maximum production, these bodies, although large and cumbersome, requiring only small pieces here and there, should be moved to the man. Considering the practical impossibility of building enough new locomotives and maintaining the maximum war effort and the shortage of man-power, the following are suggested for thought:

1—An outside inspection pit, so arranged that the engineman will leave the engine on the pit, get down off the cab and got into a work office, located not over 30 ft. away.

2—Inspectors immediately start to go over the engine.

3—An adequate pit under the engine, so that any underneath work, such as doping, can be handled with the minimum of effort. If the doper finds that the lining of an engine-truck bearing is beginning to work out power-operated jacks are handy on the floor which immediately can take the weight off so that the bearing can be changed.

4—If cylinder packing is to be removed, impact wrenches are available so that a man on the floor can take off the top nuts, while the man in the pit is removing the bottom nuts. There will be a small crane for handling cylinder heads and a piston buster available to be used if necessary.

5—Attachments will be provided so that a boiler can be blown down without excessive noise; that is, piped outside with mufflers, etc., for water reconditioning.

6—A platform at running-board height is accessible quickly from steps in the corners.

7—If it is necessary, for instance, to change a water pump, it can be picked out of the small stock available and immediately applied by a power truck.

8—A foreman should be in charge, so that immediate decisions can be made as to the work to be done, availability of the engine, and if it is OK, the work clerk may immediately call the outgoing engine dispatcher.

9—Continuous study should be made of work required on engines and equipment set up so that the work can be handled in not over 30 min. on this inspection pit.

The size of this plant depends on the number of road locomotives to be handled. At 30-min. intervals, it would work out 48 engines a day, but some allowance must be made for delays, etc., so that perhaps 36 engines a day per pit would be a better figure. Thus, if there are 105 engines to be handled a day, there should be three tracks through this plant, with quick opening doors at the ends, adequate heating facilities, and pits with passageways underneath so that the doper and others who find it necessary to work under the locomotives will not have to climb up and down for each engine, but may walk back and forth under them.

Some engines arriving will be due for washout, or it will be found necessary to do heavy work. Those engines will be handled around the plant, all inspection, etc., to be done in the enginehouse. In other words, that will be an enginehouse assignment and not an inspection-pit job.

The drawing shows the general layout of an enginehouse with this proposed engine handling facility. In addition to the inspection pits the shed houses a small storeroom, a toolroom; a work-report room, an office, power trucks, movable platforms from which the men can work, etc.

Walking Time Can Be Reduced

With such installations experience has indicated that sometimes the force of men put on them (due to fluctuation of business) find much idle time, so that this complete plan can only be used where there are enough dispatchments to support it, but if there are multiple pits, engines can be set on one pit while the men are working on another, so that when they complete an engine it is only necessary to walk a few feet to the next pit. At some terminals the men spend a substantial per cent of their time walking.

The management of this plant must do some planning to keep work continuously ahead of the men. For instance, if it is seen that there is a lull or break in incoming engines, engines would be brought from the house and, of course, various parts, dope, oil, jacks, tools, and equipment should be readily available so that the men only have to move to the wall of this "receiving ward" to obtain any necessary material or tools.

This general plan must be adapted to local conditions and the thought behind it is a "receiving ward" where within 30 min. after the arrival of an engine at a terminal a decision can be made as to whether it can be used promptly or whether it will have to be held for repairs. The utmost ingenuity should be used in equipping this receiving ward so that all normal jobs can be handled. With a compact organization such as is suggested it should be possible to add enough mechanical facilities so that a job now taking two or three hours can be handled in the normal movement of the engine through this resourcefully supervised organization.

Speed Locomotives Through the Engine Terminal

Suggestions which have removed bottlenecks both inside and outside the house

By D. V. Gonder,

Locomotive foreman, Canadian National, Montreal, Que.

Different engine terminals and main backshops frequently have identical problems. In locomotive maintenance there are so many points of similarity that the ideas found helpful at one station can be adapted to good use at others.

One engine terminal, to which is assigned a large number of heavy freight locomotives, had recently absorbed practically all the available skilled labor. Increase in business created a man-power situation which this local point had to meet. When satisfactory manpower could not be transferred from other shops, consideration was given to relieving the terminal of some of its work. One of the main backshops has a running shed, suitable for light repairs to engines from which wheels are not being dropped. It has been found that a considerable proportion of the hydrostatic tests, formerly handled at the enginehouse, can be performed at the main backshop. The usual rod work and light repairs, ordinarily taken care of at the same time are now handled by the main shop.

Getting More out of Engine Terminals

It is an axiom that engines cannot be turned out of an enginehouse any faster than they are put in. Thus, it is of paramount importance to reduce to an absolute minimum the time elapsed in getting an engine from its arrival on the shop track to its place in the house.

Marked increases in power turnover demand that every ingenuity be exercised to prevent facilities being taxed beyond their capacity at peak periods. Where pit space in an enginehouse is at a premium, consideration can be given to equipping all the extra long pits, with which most large terminals are provided, with additional smoke jacks at the turntable ends of the pits. During the periods of congestion, two short engines, back to back, can then use a single long pit.

A study may also suggest the use of additional outgoing tracks, branching off the lead from the turntable. A bank of serviced engines can then be placed outside under steam, awaiting dispatch. This will provide more pit space in the house.

Simple Improvements in Track Layout

Substantial improvements in shop track layout can result from minor alterations. One enginehouse, handling road freight and switching power, is equipped with two efficient cinder hoists on separate incoming tracks. Until recently, one of these tracks was restricted to small power because of a sharp curve at the turntable. Large power frequently overcrowded the other track with consequent delay. Half a day's labor with a section gang eased out the restricting curve, split up the ashpit work, and almost halved the incoming time required per locomotive.

The movement of engines can be speeded up by the use of spring and pneumatic switches at vital points. Operating levers for pneumatic switches can be put on posts at cab height, far enough away from the switches to enable a hostler to set his course when approaching them.

Many enginehouses still have balanced type, center suspension turntables. It is necessary to balance engines carefully on such tables to enable the motor to move the table. At one enginehouse the 100-ft. table of this type had roller bearings applied at each end over the circle rail. The vertical clearance at each end was at the same time reduced to a minimum. This has produced practically all the advantages of three-point suspension. No longer is it necessary to balance engines with anything like the same precision and all turntable movements have been speeded up.

Special Supervision for Engine Movements

Where the volume of engines handled warrants, it is advisable to put on special supervision for all engine movements. Supervisors of the regular repair staff are then not required to leave important duties to speed up the movement of engines into and out of the engine house.

This outside supervisory force can also play a very important role in the educating of new or "green" hostlers and engine watchmen, in the performance of their duties. Sad experience teaches how quickly a whole terminal can be tied up by an engine off the track at the turntable or a vital switch.

It has been found helpful to have fireboxes examined and boilers blown as soon as the fires have been dumped. This can best be done, by a crew specially assigned to the work. After the engine is in the house and the firebox and front-end work is completed, steaming-up becomes the prime consideration.

Oil Fuel for Steaming-Up

Oil steaming-up has provided substantial savings in labor, time, and convenience. Portable high-capacity burners, each easily handled by one man, are placed at the posts nearest to engine cab doors. Each burner is connected by hoses to overhead air and oil lines running completely around the house. Cheap, low-viscosity oil is steam-heated and pumped in continuous circulation at a fixed pressure. Without the use of coal, boilers can be brought up to a full head of steam for pump and injector tests, etc., and for the movement of engines under their own power. When serviced, engines can also thus be steamed-up and made available for immediate dispatch without concern for subsequent fire cleaning. When needed, the bed of coal can be laid and kindled with the steaming-up burner.

In conjunction with oil steaming-up, portable ring air blowers, suitable for slipping down engine stacks, have been found efficient and economical. These should be coupled to a separate air line around the house. Ring blowers, oil burners, and their separate parts, can be made up at the main shops to standards suitable for use at all enginehouses over a given territory.

Most important of all, it must be remembered that there is no substitute for personal zeal on the part of the supervisory staff. To cope adequately with the increased demands now being placed upon our transportation facilities, every mechanical department man must be

on his toes. If a supervisor does not show the initiative and energy necessary to the successful prosecution of his job, the best of improvements and ideas will be ineffectual.

Don't Miss These Ideas

Failures Result from Lack of Alertness

At times epidemics of eccentric rods becoming disconnected at front or back end will occur, resulting in expensive engine failures. Occasionally a knuckle pin falls out and a gang is called to clear away the broken mess so that the engine can get back to the roundhouse to be tied up for a few days while expensive and hard-to-get new parts are being applied. These types of failures should be about as prevalent as the well-known hen's teeth but still they happen because somebody was not alert or passed the buck.—*Fred C. Barnes, Laramie, Wyo.*

More Spare Parts, Fewer New Locomotives

If we had our rods, motion work, driving boxes and spring rigging prepared before the locomotives come into the roundhouse for inspection, we would save many hours. Rods should be cleaned, magnafluxed, rod bushings fitted, and in a good many cases bored to fit the pins. Naturally, to do this would require extra rods, motion work, driving boxes and spring riggings, but it would certainly be profitable. A card record could be maintained of pin sizes, and of driving-box journals on each locomotive. Journal sizes, incidentally, should be standardized as much as possible as the distance between the shoe and wedge faces is very important. In this manner we would have a clear-cut picture of the locomotive repairs before the locomotive was entered. While it is true that more steel would be needed to stock up our "assembly lines," it would be cheaper to buy steel parts than to buy new locomotives. These assembly lines at quarterly inspection time could then be one step ahead of the locomotive to be inspected by having each piece of equipment there at hand and ready to assemble as soon as the motion work is taken down. In this way we would be a step ahead and cut down on inspections and time out of service by at least fifty per cent. *J. P. Ball, Elkhart, Ind.*

Keep Men and Tools Together

Certain stalls in enginehouses should be allocated for certain types of repair work and men, with their tools and repair equipment, should be assigned to those stalls. In other words, everything for the job should be at the job if at all possible. A roving mechanic who has his tools in one end of the shop and his supplies locked up in a storehouse while he works in the opposite end of an enginehouse is a luxury that the modern railroads can ill afford when the watchword is to save time and materials. A man who becomes a specialist in his line of work can save both and do a better job.

Cooperation can come from the outside inspector who designates the stall for the equipment, the master mechanic who outfits his enginehouse stalls with the proper machines and handling equipment, the stores department that keeps the proper supplies at the job, and the foreman who designates the proper man for the job on which he shows aptitude.—*Eugene W. Preble, Alexandria, Va.*

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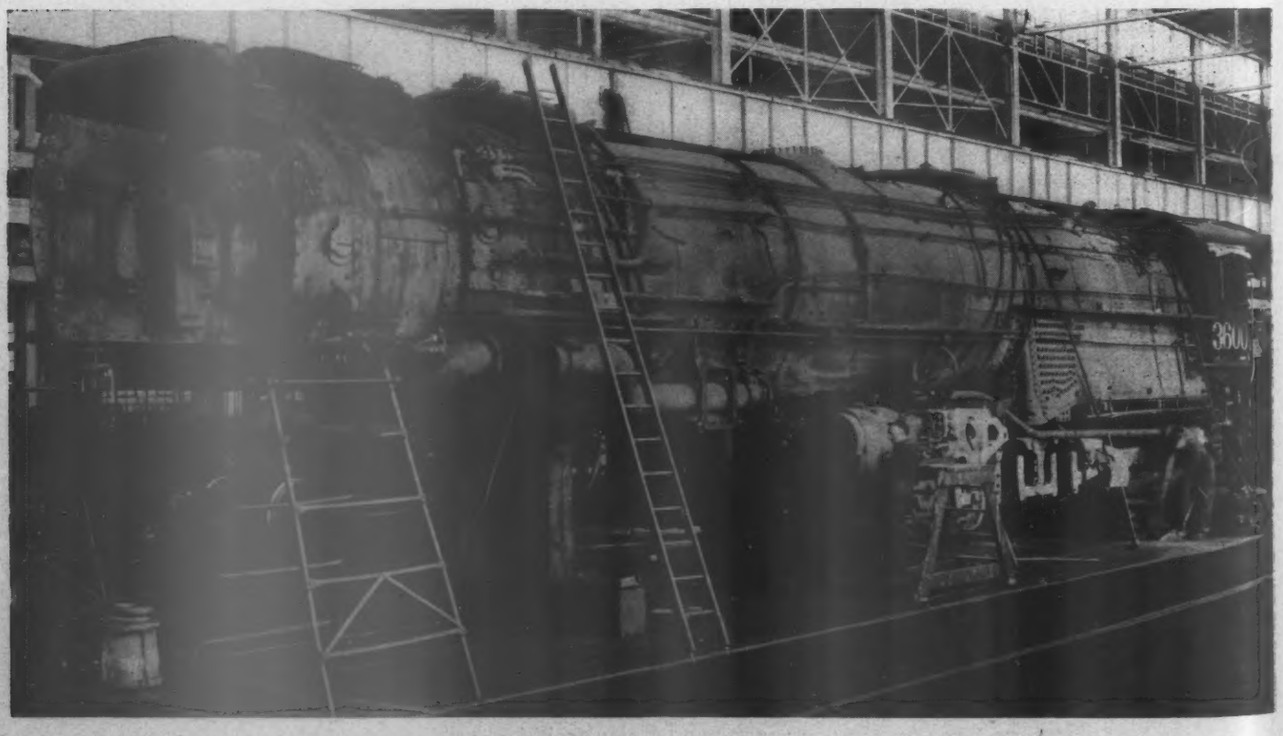


D. & R. G. W. articulated locomotive undergoing heavy repairs at the Burnham locomotive shops, Denver, Colo.

Time and Material Saving Ideas in the Field of

Railroad Shop Practice

A selection of practical suggestions from many sources showing how shop facilities may be utilized to the greatest advantage and how improved methods may speed up shop operations

FROM the railroad repair shops of the United States—small and large—and from others indirectly associated with railroad shop work—a total of 15 papers were submitted as entries in the contest. On this and the following 11 pages appear a selection from the wealth of material dealing with this important part of mechanical department work. Leading off this section is a paper on the potentialities of the internal grinder in the finishing of a variety of locomotive parts in which the author has analyzed the savings that might be expected as a result of the full use of this type of machine. Another contribution shows the way to the solution of a difficult job of boiler shop work.

In these days of 24-hour, seven-day operations we may feel that the depression's years are far behind us so another author is reminding us that the trying experiences of the depression years were in reality but a training school in which we learned lessons of present value. Other contributions will appear in future issues.

Grinding — A Practical Aid to War Production

An analysis of the comparative cost of finishing locomotive parts by tooling and grinding

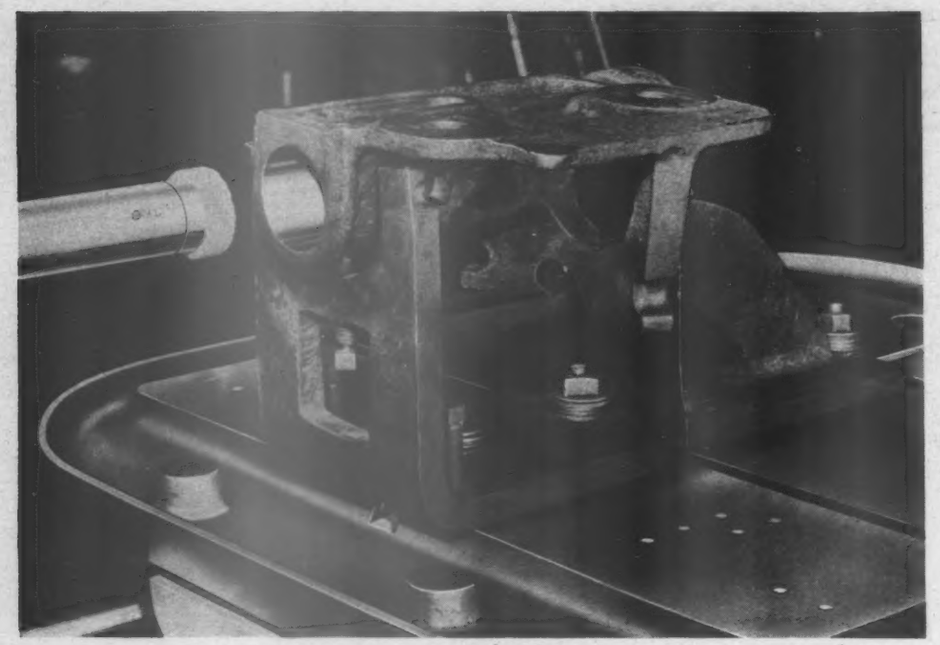
By H. H. Moor,

Sales manager, Grinder Division, Micro-Westco, Inc.

Railroad mechanical officials and shop personnel have justly earned public acclaim for their competent efforts to meet the heavy demand for locomotives and cars in this time of national emergency. And they have been obliged to increase results with facilities at hand, since high priorities on machine tools for defense contracts have brought about a scarcity of new equipment and long deliveries.

Ingenious methods and mechanical experience have contributed much to the speeding of repair operations, but frequently overlooked is the fact that additional and valuable gains can be made through the reconditioning of many locomotive parts by grinding instead of tooling. Cylindrical and internal grinders are available in most repair shops, and the advantages offered by these machines are numerous and far reaching. Not infrequently, however, these time and labor saving tools stand idle while the work for which they are ideally suited is done on lathes and boring mills.

Because time is an important factor in the defense program, it is of particular significance that the benefits of grinding be promptly realized. The grinding oper-



Franklin Butterfly firedoor cylinder set up on a special fixture for grinding

ation invariably requires less time than other methods and removes a minimum amount of stock with a worthwhile saving of metal. The accuracy and superior finish produced by grinding insure close fits and maximum bearing surfaces that are essential to trouble-free operation, the ground parts run longer before repairs are needed again, and of great importance, grinding increases the life of parts by 150 per cent to 300 per cent.

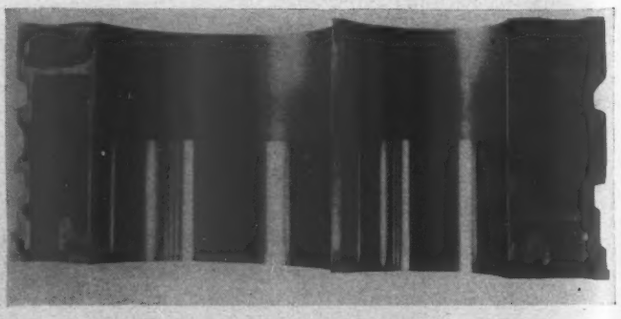
The comparative effects of grinding and tooling on locomotive parts in general are well demonstrated by the fact that a worn piston rod can be trued up accurately and smoothly by cylindrical grinding with only a slight reduction of its diameter, whereas the same job in a lathe requires the removal of more than twice as much metal due to the necessity of the turning tool to penetrate beneath the glazed surface. Hence, the lathe operation shortens the life of this expensive part, and the resultant finish is not of sufficient quality to insure steam-tight packing contact or longest wear.

To determine whether one process of reconditioning is better than another, several factors must be taken into account. Original cost of the part, expense of maintenance between shoppings, amount of money spent at repair periods, and life of the part, all have an important bearing upon the net results. Only by complete analysis, therefore, has it been possible to ascertain the total effects of the tooling and grinding processes on various locomotive parts.

One such investigation was conducted on driving rods, since the need for repairs to these important members is one of the chief causes for heavy expenditures. The findings of this analysis prove conclusively that grinding the rod eyes will save an unusual amount of money, and also serve to demonstrate how the several factors were considered in all the surveys made.

A 4-8-4 locomotive was selected for this driving-rod analysis, because this type is fairly representative of the general run of freight and passenger power on the railroads in the United States and Canada. This particular locomotive is a modernized type, equipped with lightweight channel rods which cost $1,850 for the complete set of eight. It was also found, however, that some of these locomotives were equipped with rectangular rods that cost only $1,050 for the entire set. Although the trend is toward the light-weight rods for high-speed service, a conservative average of these two prices, or $1,450, is used in the survey as the representative cost of a set of rods.

On this type of locomotive, the back ends of the main rods and the main-pin ends of the intermediate side rods are equipped with cast-iron fixed bushings and brass floating bushings. The other rod eyes are equipped with pressed-in brass bushings. The diameters of the 14 rod eyes, exclusive of bushings, are as follows: main rods, 12 in.; intermediates, 12 in. and 7-in. knuckle-pin holes, 5½ in.; front ends, 6½ in.; back ends, 6½ in.



Section of a cross compound air compressor in which the finishing has been done by both boring and grinding to show the difference in the surface

Tram centers of wheels were 5 ft. 8 in.

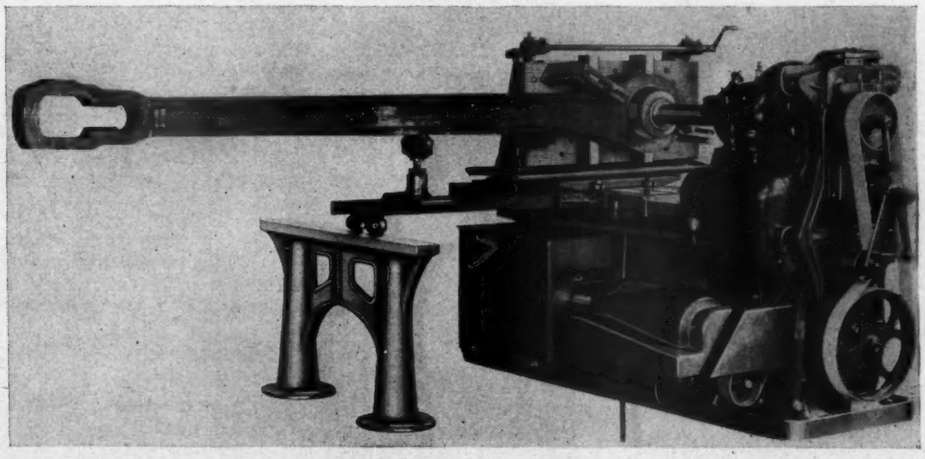
The investigation disclosed that some of the rod eyes have been reconditioned by boring during the past several years while others were ground on an internal grinder, which fact has made possible some interesting comparisons of actual results. Labor costs in this and the other surveys made are based upon the new rates of 96 cents an hour for machinists and 70 cents for helpers. Engines are shopped every four years as an average for new boiler flues and a general overhauling. Rod eyes are refinished at each shopping period to restore roundness.

Effects of Boring and Grinding the Rod Eyes

The number of times a part can be reconditioned before reaching the condemning limit depends upon the amount of metal removed each time and the wear. In this case the oversize limit for the rod eyes is ¼ in. and the rods are retired from service when this limit is exceeded.

The average time for reboring all of the 14 rod eyes on this type of locomotive is 22 hr., and the average time for regrinding is 18 hr. Especially important is the fact that the amount of eye enlargement at each shopping period (every four years) by boring averages about 5/64 in., and by grinding about 1/32 in. As a result of the excessive enlargement by boring, the rod eyes can only be reconditioned three times before the ¼-in. oversize condemning limits are reached, therefore the life of these expensive parts is shortened to 16 years including the first four years of service while the rods are new. Owing to the small amount of enlargement by grinding, the rod eyes can be refinished eight times (every four years), hence the life of the rods is increased to 36 years, including the first four years of service, which is longer than the life of many locomotives.

These findings show that boring the rod eyes will cause the railroad to spend $1,450 for the new set of rods, plus a total of 66 hr. machinist labor for reboring the eyes three times during the 16-year life of the rods, an average expenditure of $94.58 per year.



Grinding the fixed bushing of a main rod after the bushing has been pressed in. The special stand provides rigid support and eliminates the necessity of overhead suspension

During the 36-year life of the ground rods, $1,450 will be spent for the new set of rods, plus a total of 144 hr. machinist labor for regrinding the eyes eight times, an average expenditure of $44.12 per year.

This divulges that grinding the rod eyes will save about $50 per year on the bare rods alone of each locomotive overhauled. At 18 hr. per set of rods, one internal grinder will be kept continually busy on the rods of 11 locomotives a month, or 132 locomotives in 12 months, at an annual saving of $6,600.

Effects of the Two Processes on the Fixed Bushings

The four fixed bushings of these rods are close-grain grey cast iron and cost about $8.50 each for material and labor. To permit close inspection for rod defects, these members are pressed out at each shopping period. Where the rod eyes have been bored, the fixed bushings have had a tendency to work loose on account of poor bearing surfaces on top of the boring-tool marks, and although pressed in at 40 to 50 tons, are frequently loose enough to drop out of the rods when the engines come in for shopping. This means that about half of the fixed bushings, (two on this type of locomotive) must be renewed at a unit cost of $8.50, or $17.00 on each of the 132 locomotives overhauled in a year, a total annual cost of $2,244.

Loose bushings in service not only result in excessive pounding, wear, and undue elongation of the eyes that require over enlargement for true-up at shopping periods, but present some difficulties at the terminal points when renewing floating bushings.

The expense of new fixed bushings is saved when the rod eyes are ground because the bushings stay tight. Only 15 or 20 tons pressure is used to press the bushings into the ground eyes, and they actually require as much as 40 to 50 tons for removal. The first case is yet to be found where a bushing became loose in a rod eye that was finished by grinding. When removed, these bushings show full bearing, shiny surfaces and can be tightly pressed back into the rods for further use after the inspection is completed. The insides of the fixed bushings are always ground with a light true-up cut after pressing in.

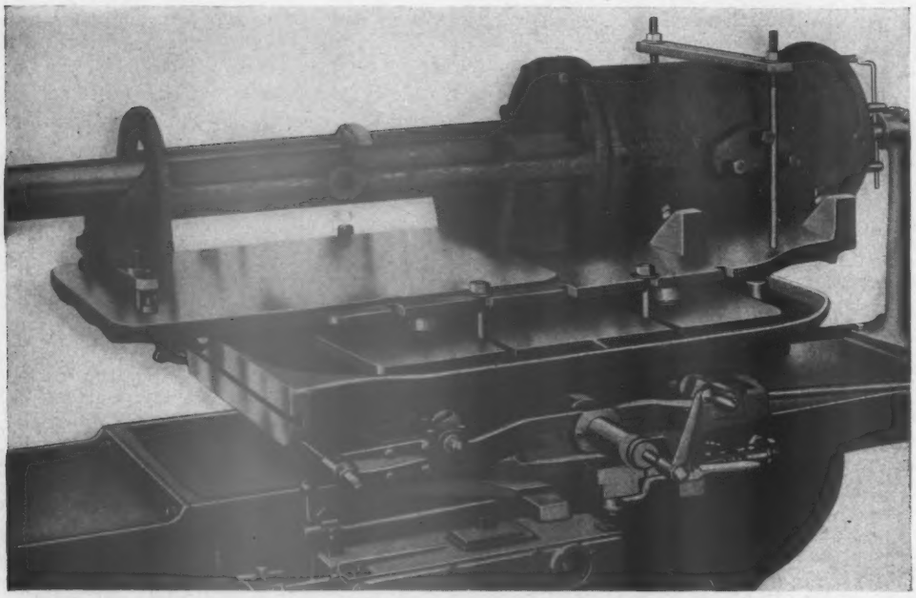
Correcting Tram Centers

Particular attention is paid to tram centers which are held closely to blueprint dimensions. During the tramming operation, the eyes are marked with chalk .010 in. long or .015 in. short as the case may be. The graduations on the cross-slide of the grinder are especially valuable for quickly correcting these tram centers.

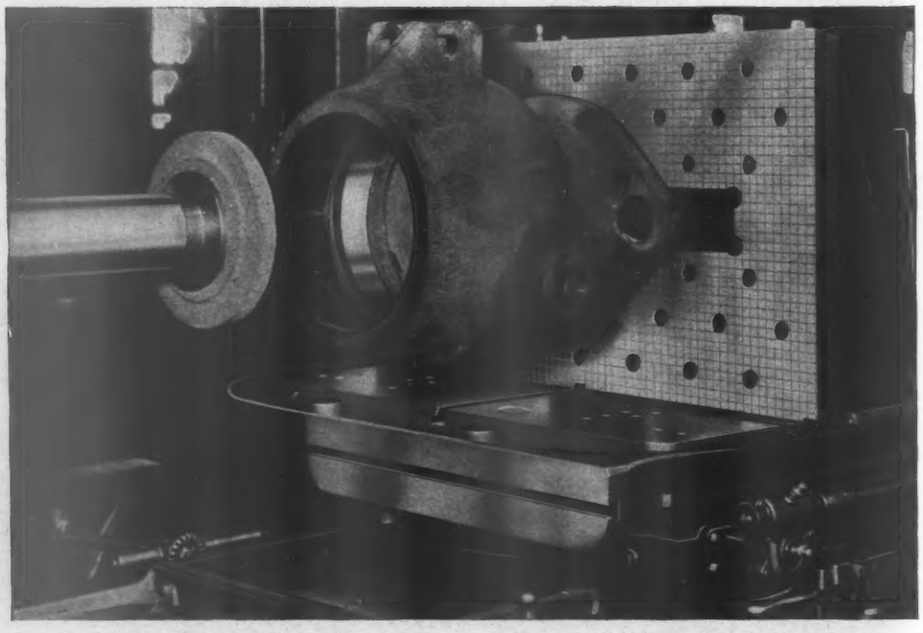
Grinding Saves Floating Bushings

Owing to the accuracy, smoothness, and full bearing surfaces provided by the ground fixed bushings, the brass floating bushings will run longer before renewal is necessary. It has been carefully estimated that at least a pair of these floating bushings will be saved in the main rods during the first year of service, while the crank-pins are comparatively round. This means that about 22 floating bushings, which cost $24.40 each, or $536.80 for all, will be saved while the first month's output of 11 engines is in service the first year.

Eleven more locomotives will complete their first year of service each succeeding month, hence an additional saving of 22 floating bushings, or $536.80, will have been earned at the end of the thirteenth month and each month thereafter. At the end of two years, therefore, a total of 286 floating bushings, or $6,978, will be saved.



Grinding the circular guides and cylinder of an Alco Type E power reverse gear on an internal grinder. In this case a heavy duty spindle and special fixture are used



This is a simplified set-up for grinding a throttle valve chamber

During the second, third and fourth years of service after the locomotives have been shopped, the life of the floating bushings is largely dependent upon the condition of the crank-pins. If the pins are around during these years, further savings on floating bushings may be realized, but since this is problematical it has not been taken into account.

Grinding Other Locomotive Parts

Too great length would be required to show all the figures of the several other investigations made, but the net results on the major parts that might normally be reconditioned on an additional internal grinder are shown in Table II.

This tabulation shows a yearly saving of $77.91 per locomotive for material and labor in favor of the grinding process, but does not take into account that the steam saving with three popular types of air pumps averages about $95 per year for each pump, which savings have been proved by a series of costly tests that are representative of actual operating conditions. The annual saving to the railroad, therefore, as a result of the grinding of these miscellaneous parts is approximately $172 per locomotive.

The above list of parts require approximately the same amount of time as the set of driving rods (18 hours), thus the second internal grinder will handle all other parts on 11 locomotives a month, or 132 a year, at a total saving of $172 times 132 which equals $22,704 per year in material, labor and steam.

Table I — Summary of Savings Made on Rods and Bushings

Material and labor saved each year on the 132 sets of rods, exclusive of bushings	$6,600
Material and labor saved each year on fixed bushings, $17 for two bushings times 132 locomotives	2,244
Material and labor saved during the first year of road service on 22 floating bushings at $24.40	536
Total saving the first year as a result of grinding the rod eyes and insides of fixed bushings	9,380

It is of course recognized that types of equipment on the many styles of locomotives are widely diversified. Although an engine may not be equipped with driving boxes of the floating bushing type, it may be operating with two cross-compound air-pumps, or a feedwater pump. Then, too, other parts that might require grinding are booster engine cylinders, stoker engine cylinders, bell-ringer cylinders, grate-shaker cylinders, Diesel-engine cylinder liners, motor-car cylinders, exhaust bushings and main-valve sleeves of air-pumps, etc. The net results, therefore, are not apt to vary an appreciable amount.

The ability of these two internal grinders to earn a clearly indicated saving of over $30,000 each year strongly suggests the advisability of keeping grinding machines busy.

Table II — Comparative Costs of Finishing Locomotive Parts

	Average annual costs of material and labor per locomotive	
	By Tooling	By Grinding
1—Cross compound air-pump	$53.28	$24.26
1—Power reverse gear with circular guide	5.08	3.50
1—Set of valve-motion parts	53.57	19.19
8—Driving boxes of floating bushing type	30.08	19.20
1—Chambers throttle valve	1.38	.88
1—Fire-door-opener cylinder	4.00	2.45
Total	$147.39	$69.48

Study The Job More Intensely

Many of the problems with which we are daily concerned offer opportunities for improved solutions

By Harry G. Miller,
Engineer of Tests, Chicago, Milwaukee, St. Paul & Pacific

The equipment and ability is available to make improvements in shop production, the utilization of machine tools, improved engineering design and the selection of materials to release critical materials for the war effort.

Shop production can be increased by intensive study of each operation from the raw material to the finished product. Forgings and castings can be made to closer tolerances and heat treatment used to facilitate machine work and improve the resistance of many parts to wear and failure.

Many tools now on railway budgets will not be delivered until all armament plants are completed and partial replacement available. Without new tools, many machines should be rebuilt and made serviceable either for general purposes or special work. Every machine tool should be maintained at its maximum efficiency and scheduled so that each tool produces the type of work for which it is best adapted.

Conservation; Including Tool Steels

The most urgent problem at present is the conservation of materials so that the primary producing capacity of the nation is available for total war effort. The ever changing material situation will make different materials critical at different times and the railroads must face this problem with an open mind and with prompt and drastic action.

Among other items which will conserve primary material is the reclamation of locomotive axles and crank pins from larger to smaller classes by Magnaflux inspection, heat treatment and machining. When the final limits are reached the material can be reforged for less important parts.

By similar line of reasoning and action, tool steel can be reforged to smaller sizes and used in improved tool holders. Tungsten is an extremely critical alloy and its use in carbide cutting tool tips vastly increases its utility per available unit. The practice of boring locomotive tires to smooth finish with carbide tools has entirely eliminated the bore crack type of locomotive driving tire failure. Restrictions on tungsten, cobalt, chromium, and vanadium make the subject of tool conservation one of extreme importance.

Improved engineering design must be continued so that the railroads can take advantage of each opportunity to conserve the maximum amount of basic material. For example, the application of light-weight rods and motion-work parts on locomotives will reduce the weight of steel requirements by as much as 30 per cent. Likewise, the use of low-alloy, high-strength steel deserves intensive study to determine the best policy with respect to the total demand on the steel producing capacity of the United States. Further, it must be kept in mind that improvements in locomotives and cars with respect to balance and tracking characteristics are economies in track maintenance.

Be Careful with the Torch

The use of the acetylene cutting torch has in many cases become an extravagant least-resistance sort of habit, rather than a cost-reducing device. The use of the cutting torch should be restricted to the removal of material which is definitely scrap and the destruction of bolts, nuts, washers, clamps and other usable items should be avoided because the destruction of these items increases the load on vital manufacturing plants. The pantagraph torch cutting machine is in quite a distinct category and has its place as a definite labor saving manufacturing tool. In vivid contrast to the injudicious use of the cutting torch, autogenous welding should be more generally used in the construction of locomotives and cars.

Time For the All-Welded Boiler

The all-welded locomotive boiler should be authorized for use on new locomotives and the replacement of boilers, which are now causing heavy expenditures for repairs, on account of unsatisfactory riveted construction. Welding methods are beyond the experimental stage, heat treating and inspection facilities are available and the conservation of steel-making capacity demands the elimination of unnecessary rivets and joint cover plates. The record of the Delaware & Hudson ex-

perimental boiler shows the futility of further delay on this development.

What the A. A. R. Is Doing

Studies are now under way under the direction of the A. A. R. and with splendid co-operation from manufacturers, to reduce the use of copper and copper base alloys, tin, zinc, lead and rubber. Again we are faced with the changing situation as illustrated by restrictions on galvanizing to conserve zinc, which has already increased the demand for lead base paints to an unexpected degree. A fine sense of balance must be maintained to allow a constant shift in paint pigment and vehicles depending on the immediate situation. As the rubber situation becomes more acute the multiple V belt must give way to the self-adjusting flat leather belt or geared drives on machine tools, air compressors.

The demand for solid fuel by power-generating stations and industry, require the use of many additional cars which can be partially offset by a more intensive practice of fuel economy in heating plants and on locomotives. Fuel economy starts at the mine and must be vigorously policed until the ashes are dumped where they are useful and not a nuisance.

A system of scheduled freight-car inspection and maintenance which reduces the average number of bad order cars one per cent will be equivalent to building 18,000 cars for the American railroads.

Schedules—Wrong Kind or Right Kind?

Most schedules are made on a time basis whereas the important thing is sequence of operations

By T. E. Hickey,
Houston, Texas

In order to improve on any type of operation it is essential that the present methods be thoroughly understood.

The locomotive to be repaired is brought into the shop, after being disconnected from its tender. In some instances the bricks have been removed from the firebox, jackets removed from the cylinders, and the superheater units examined, but in other cases the locomotive is placed in the shop immediately after coming in from its run. In either case the first big job is to take the locomotive off its wheels and place it over a pit. While the preparations are being made to remove the wheels, other work is also going on in the cab and at the front end.

Locomotive Dismantling Procedure

In the cab, the carpenter and helper are removing the seat boxes, and are trying to remove the curtains, awnings, doors and windows. At the same time, air men are trying to remove air valves, disconnect air gages and remove various pipes. Another mechanic is attempting to remove steam gages and water glasses. The electrician and his helper are removing light shades and unfastening the flexible conduit from the jacket. In addition, a mechanic and his helper are usually trying to remove other work. This method can only result in confusion and a slowing up of the work.

How should this work proceed?

First, let the carpenter and helper remove the seat boxes, curtains, windows, etc., from the cab while other men are working on some other part of the same locomotive, or on some other locomotive. The next thing should be the removal of the steam and air gages. This should be followed by the removal of the electrical equipment, then the air work, then the pipe work and finally by the removal of jacket and lagging. Of course, some of this work would not be finished until after the locomotive was placed over the pit. All the other parts of the locomotive could likewise be properly scheduled for the sequence of operations and the entire locomotive dismantled in this manner.

After it has been dismantled and the parts properly examined for defects, then a repair and assembly schedule should be worked out. This should be carefully done so that conflicts with the repair and assembly schedule of other locomotives and equipment in the shop can be avoided.

The practice at present is to work up a time schedule for the repair of the parts and partially for their assembly on the locomotive. The main difficulty with the time schedule is that it does not fit with the sequence of operations, or sequence schedule. The other difficulty with the time schedule is that it is not adhered to. The remedy is to work out the sequence schedule first, and base the time schedule upon it.

Several things should be carefully considered when working out the repair schedule:

1—Have the proper blueprints and specifications available. Good blueprints may be expensive in the drafting room, but they are money, time and material savers in the shop. Do not expect good, fast workmanship unless the proper blueprints and specifications are at hand.

2—Improvements and changes to be made on the locomotive should be known as soon as the locomotive is in the shop for repairs. In this manner parts that are no longer going to be used can be cleaned and used for other purposes, or scrapped as the case may be.

Not only can this work be scheduled in this manner in the Locomotive Department but also in the Car Department as well, thus putting the entire Mechanical Department on a sequence schedule basis.

Of course, the working out of the first few sequence schedules will be a big task and is likely to cause some confusion in the departments, but it will be worth the effort. In fact, the first schedule will have to be changed quite a bit before anything like a workable one can be had, but if one is worked up carefully, the following results may be expected: (1) better work will be done; (2) work will be speeded up without tiring the workmen beyond their ability; (3) material will be saved, and (4) safety records will improve. It is a well known fact that fatigued workmen, crowded conditions and rushed work makes for the increase of accidents. Remove these causes and accidents will decrease.

Simplified Method of Firebox Repair

A detailed description of the shop facilities needed to do a difficult job easily

By E. H. Heidel and H. W. Chandler,

Chicago, Milwaukee, St. Paul and Pacific, Milwaukee, Wis.

The repair of large locomotive boilers, and particularly those on modern high-pressure locomotives, has placed a heavy burden on the average railroad boiler shop, few of which are equipped with entirely adequate machinery for the manufacture and fabrication of replacement parts for fireboxes and boiler shells. The hydraulic press plays an important part in the boiler shop, and with the proper dies and formers a considerable variety of work can be handled.

As an example of the foregoing, the manufacture of inside throat sheets on an open front hydraulic press of 200-ton capacity and in a range of sizes to accommodate all combustion chamber boilers on the railroad has been accomplished, in the manner described here.

Inside throat sheets ordinarily require repairs in the vicinity of the throat sheet "ears" long before the body of the throat sheet requires renewal. This fact led to the manufacture of throat sheet ear patches under the hydraulic press, two ear patches for opposite sides of the boiler being formed in one operation on a simple set of blocks. A set of ear patches for right and left sides of the boiler is shown in Fig. 1, and the blocks used for their manufacture are shown in Fig. 2. It will be noted that considerable variation can be made in

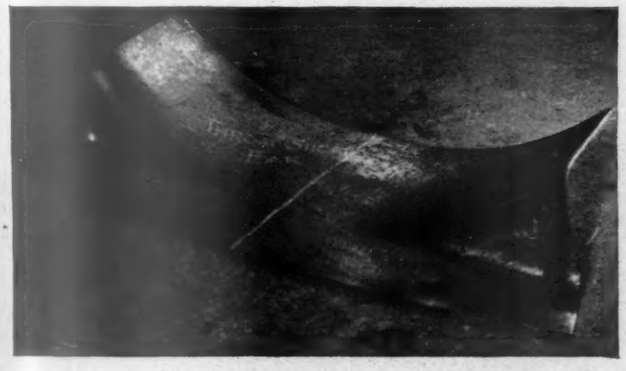
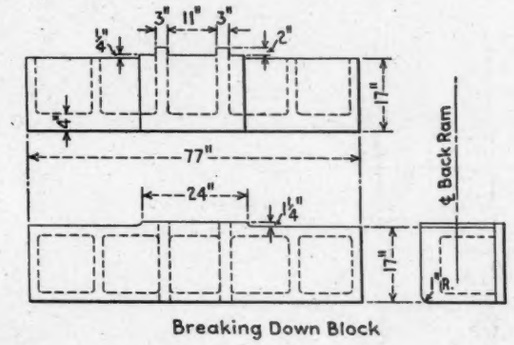


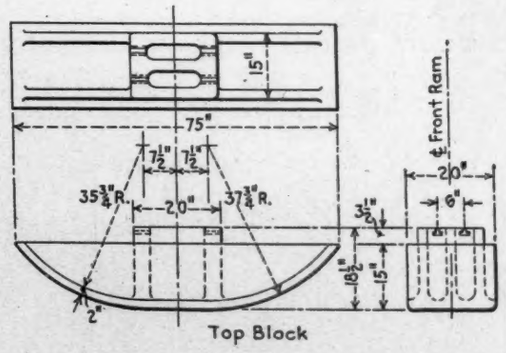
Fig. 1

the width of the patch, and the one throat sheet ear pressing has been successfully applied to all classes of locomotives on the railroad employing a combustion chamber with little or no alterations. After being properly fitted up, the throat sheet ear patch is butt welded to the crown sheet, side sheet, throat sheet, and combustion chamber sheet, after which the patch is adequately stayed by the application of the usual rigid and flexible staybolts.

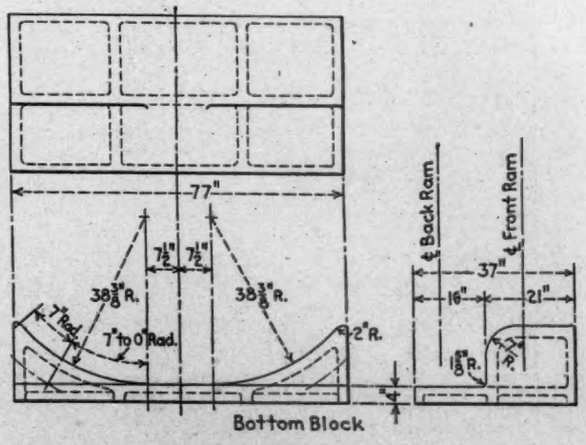
The successful use of a large number of ear patches over a period of years indicated the feasibility of applying inside throat sheet and throat sheet ears separately when renewing the throat sheet. This materially simplifies the manufacture of the inside throat sheet and its application to the firebox, as well as effecting a saving in material. Flange blocks for forming the inside throat sheet are shown in Fig. 3 and the blocks in place on the hydraulic press are shown in Fig. 4. It will be noted that one ram of the press is used first to form the bend in the lower part of the throat sheet and subsequently to hold the sheet in place on the bottom block, while the breaking-down block on the second ram forms the throat of the sheet. In a number of cases, a small variation in the throat sheets formed on a set of these blocks will adapt the sheet to another class of boiler.



Breaking Down Block



Top Block



Bottom Block

Fig. 2

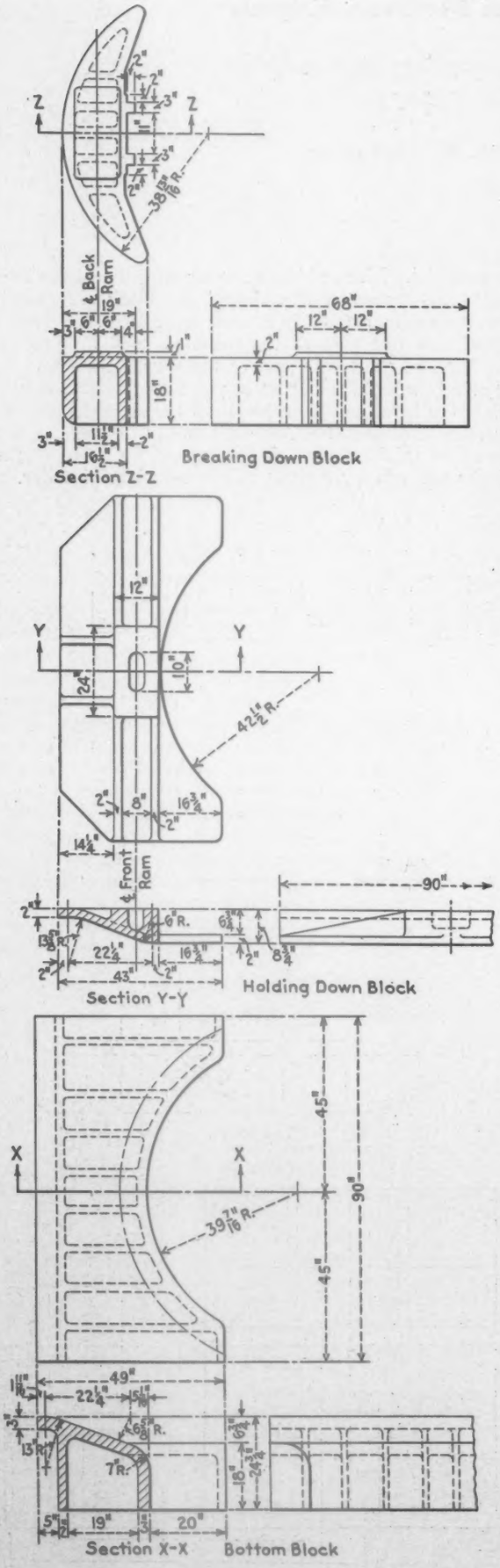


Fig. 3

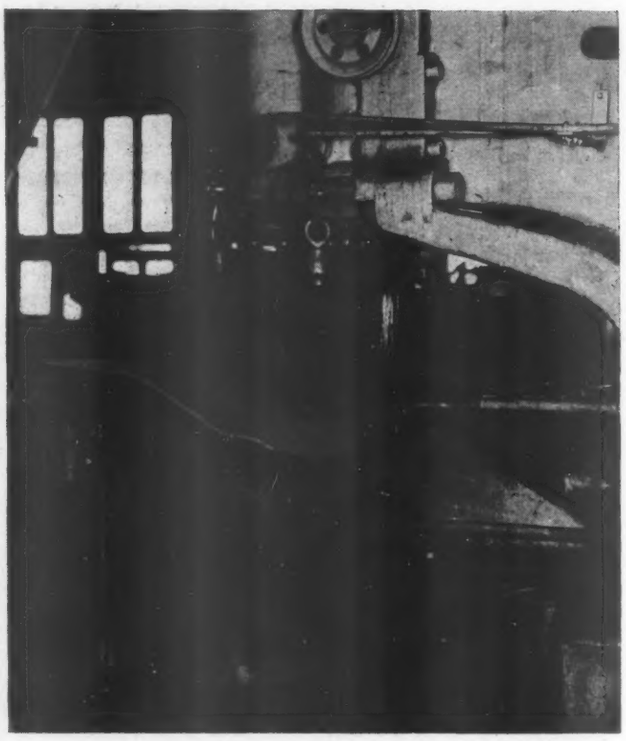


Fig. 4

As a by-product of this method of flanging throat sheets, the transition from riveted seams to welded seams in the firebox is simplified for the reason that provision is made in the forming blocks for long flanges, permitting the location of the welded firebox seams between two rows of staybolts. All lap seams and double thicknesses of firebox sheets are thus eliminated. On one class of freight locomotives having a particularly short combustion chamber, the long flanges on the inside throat sheet, the throat sheet ears, and the back flue sheet has made possible the elimination of the combustion chamber sheet, the long flange of the throat sheet being welded directly to the flange of the back flue

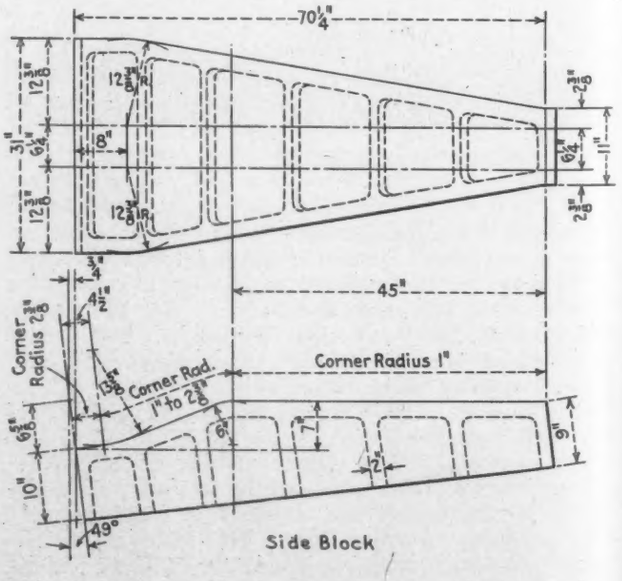


Fig. 5

Fig. 6—Forming the syphon neck opening with a ball die in the hydraulic press. The heating is done locally with an acetylene torch

sheet. In the case of a throat sheet finished with the long flange which can be welded directly to the back flue sheet flange one weld is eliminated.

The throat sheet side flange is formed under the hydraulic press by using the side block shown in Fig. 5, and the same breaking-down block which is used for the throat sheet ear pressing. Throat sheets for syphon-equipped boilers have the syphon neck openings formed in the sheet by pressing a ball die through the sheet and into a suitable block, which is standard for all classes of syphon-equipped boilers. In this operation, shown in Fig. 6, the throat sheet is set up in the press and heated locally by means of an acetylene torch. This method simplifies the handling, reduces the time required for the operation, and the sheet is not warped. A throat sheet patch complete with syphon neck openings made in the above manner is shown in Fig. 7. The process described eliminates considerable hand flanging.

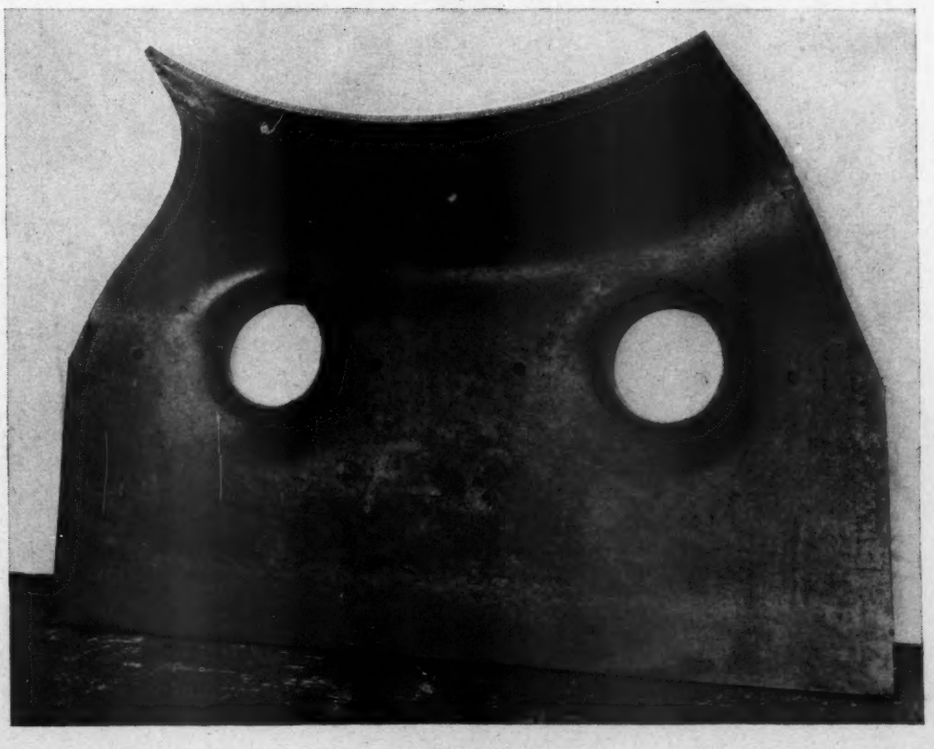


Fig. 7—A throat sheet patch, complete with syphon neck openings, which was made in the manner described in Fig. 6

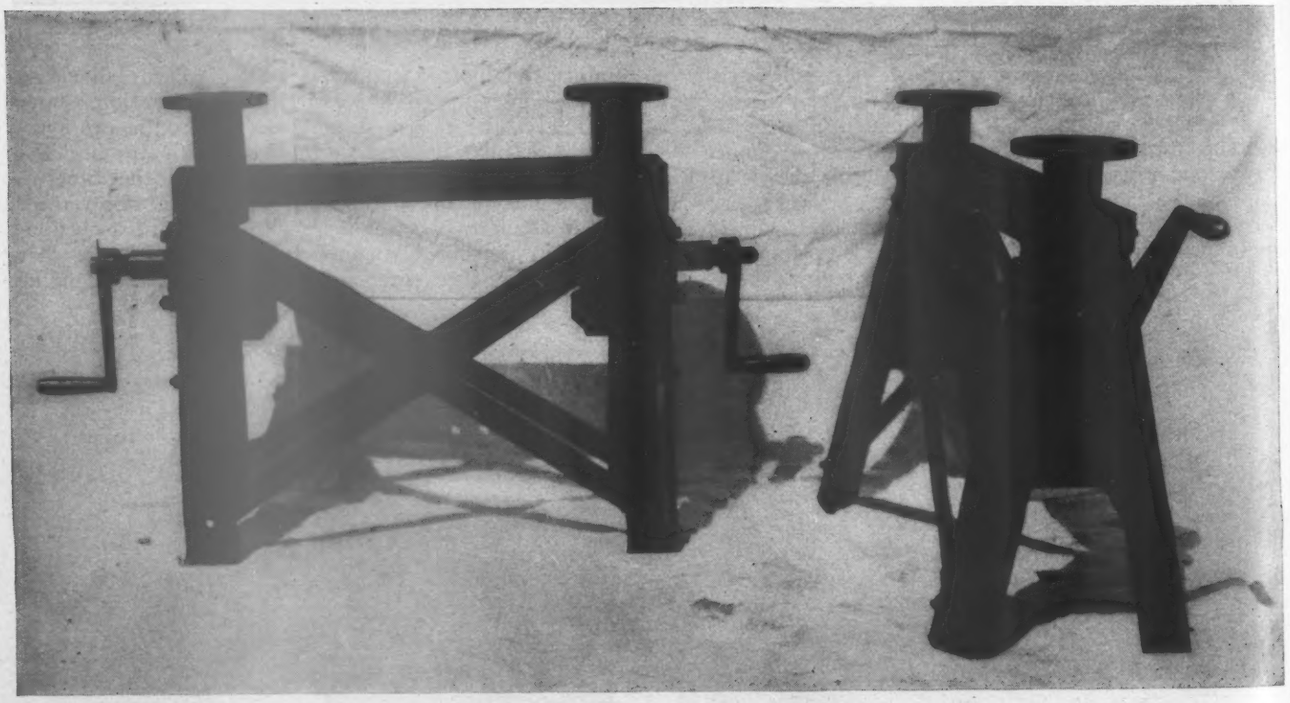
Devices for handling roller bearing axles and boxes

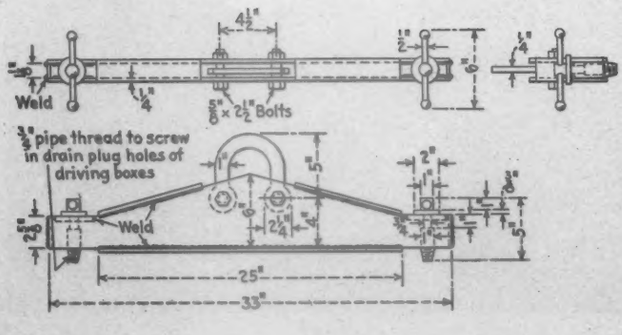
By J. R. Phelps,
Machine Foreman, A. T. & S. F., San Bernardino, Calif.

[The shop kinks on this and the following three pages are selections from a large number submitted as contest entries by Mr. Phelps. Others will appear in subsequent issues—Editor.]

The handling of driving wheels and axles, where equipped with roller bearings, has injected into locomotive shop work the necessity of developing a number of new and original devices for simplifying the work and protecting the finely finished surfaces.

Fig. 1 (Top)—Wheel set as removed from locomotive with lifting sling in place; Fig. 2 (Center)—Side and end views of lifting jacks; Fig. 3 (Bottom)—Detail of sling showing method of attachment





Not the least important part of the job is the dismantling of the wheel sets in order that the axles, boxes and bearings may be carefully inspected. The photographs on this and the opposite page show a method and the devices with which this job may be done.

In Fig. 1 the wheel set is shown as it came from the locomotive, after having been thoroughly cleaned. The wheel set is mounted on the lifting jacks, one of which is shown in Fig. 2. These jacks are shop made with structural framework and screw-type heads which have been made from jack parts. The head screw drive is through bevel gears. The jacks, when placed and the

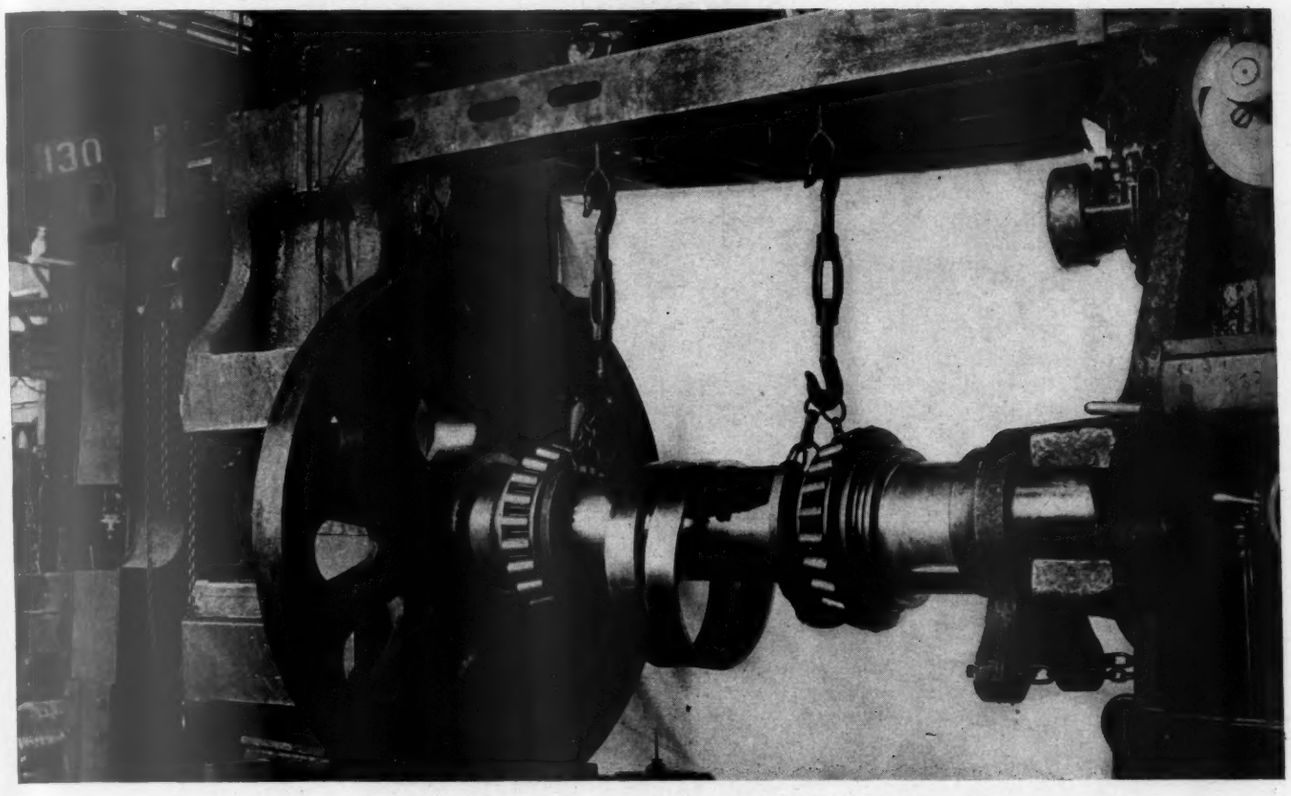
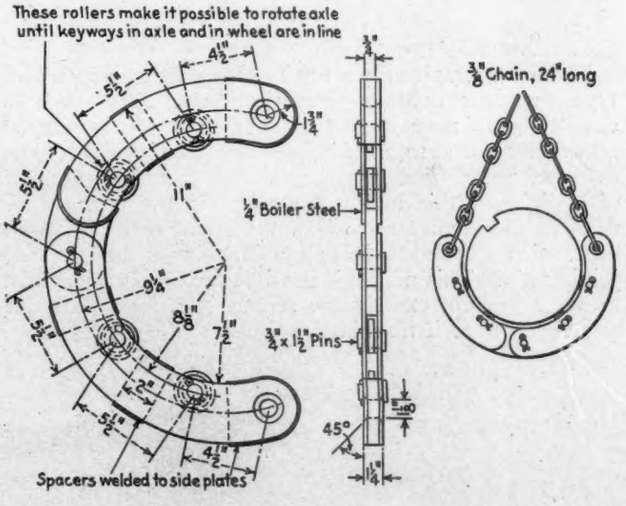


Fig. 4 (Top)—Roller bearing driving wheels in wheel press with boxes removed, showing roller-type sling attached for lifting axle; Fig. 5 (Center) — Drawing of the roller sling; Fig. 6 (Bottom) — Clamp for turning lower half of box

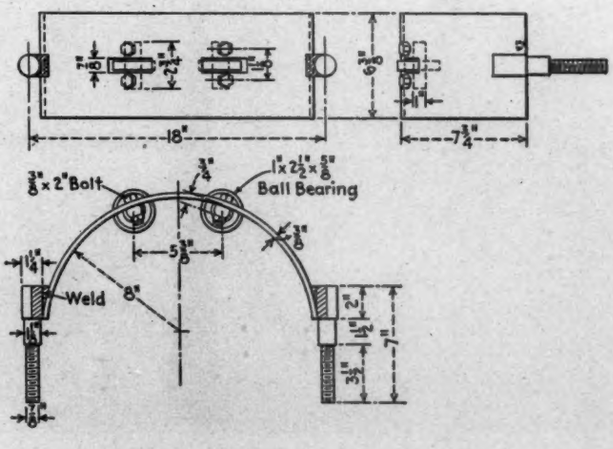


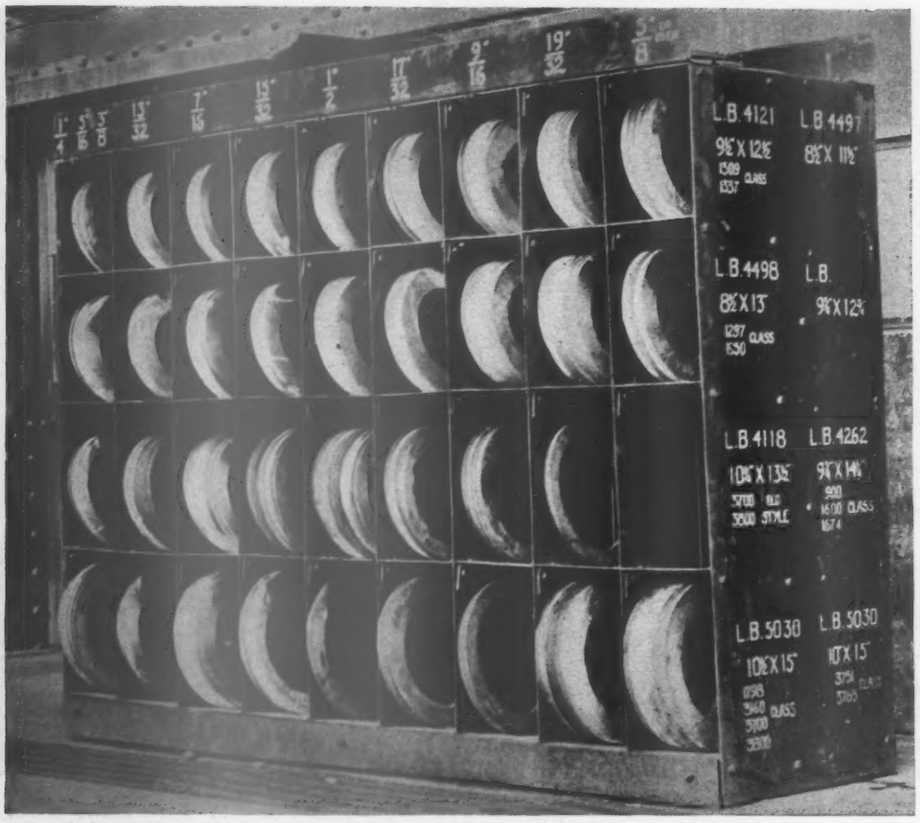
heads run up, put the entire weight on the jack heads and blocking and the bolts, holding the two halves of the box together, are removed. The lifting sling is fastened in place by the insertion of the special bolts in the drain-plug holes of the box after the box has been rolled over on the axle. Then the top half of the box is lifted off.

Owing to the fact that the bottom half of the box can not be lowered to the floor because of interference with the counterbalance it is necessary to lift it off. So, the clamp, shown in Fig. 6, was designed to be inserted in bolt holes of the bottom half and drawn down until the rollers are in contact with the axle. Then the bottom half is rolled over, the lifting sling attached, the clamps removed and the half box lifted off.

Roller Sling For Lifting Axles

Figs. 4 and 5 show a metal roller-bearing sling for holding driving axles of all types at the wheel press. During the wheel-press operations it is necessary to roll the axle around in order to line up keyways and this must be done in such a manner that the finished surfaces are not marred in any way. The sling shown here makes it easy for the wheel-press operator to perform this operation with one hand. The sling is constructed of ¼-in. boiler steel, with a hinge located in such manner that the rollers can adapt themselves to a variety of axle diameters. The sling side frames are held by welded spacers and the hardened and ground rollers are secured in the frames by ¾-in. by 1½-in. pins.





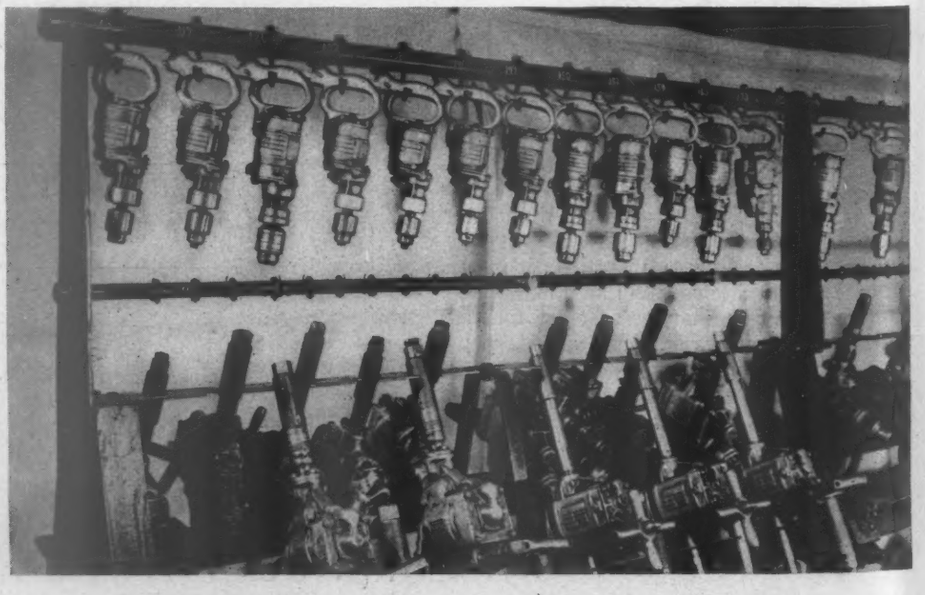
Rack for holding brass eccentric lateral liners

Racks Make It Easy To Find Things

The photograph at the top of this page shows a bin-type rack for holding eccentric liners. The rack is double, being open on both sides, each side having 36 separate bins, a total of 72. Each of the eight rows contains liners of a given bore and diameter but each of a different thickness. All liners in the bins to the right of the picture are 5/8-in. thick and each bin, from right to left, contains liners 1/32 in. thinner than the adjoining bin. This makes it possible for a floor machinist to get a liner of exactly the required thickness without waiting to have it machined.

The back of each bin is 1 in. lower than the front so that the inclined bottom will cause the liners to roll into the bin and not out on the floor. At the top of each vertical row is a slot gage which simplifies the job of checking the thickness of the liner selected. The engine class, bore, outside diameter and pattern number is stencilled in white on the ends of the bins.

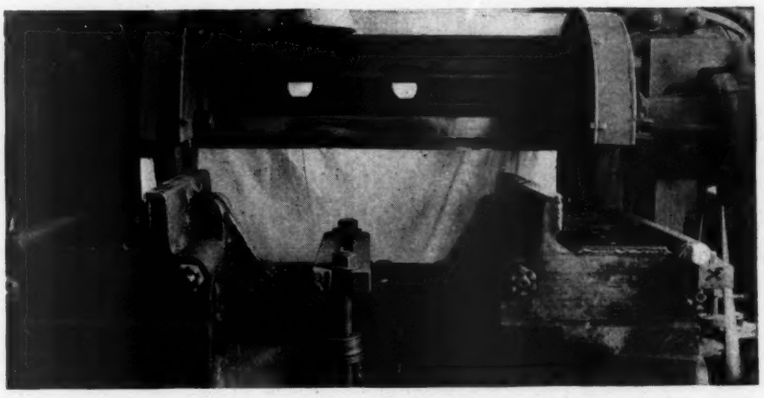
The photograph below is an air-tool rack holding 23 small drills and 41 large drills. Each tool has a number and when the tool is gone from the rack a check bearing that number must be in its place. This provides a simple and effective tool check system.

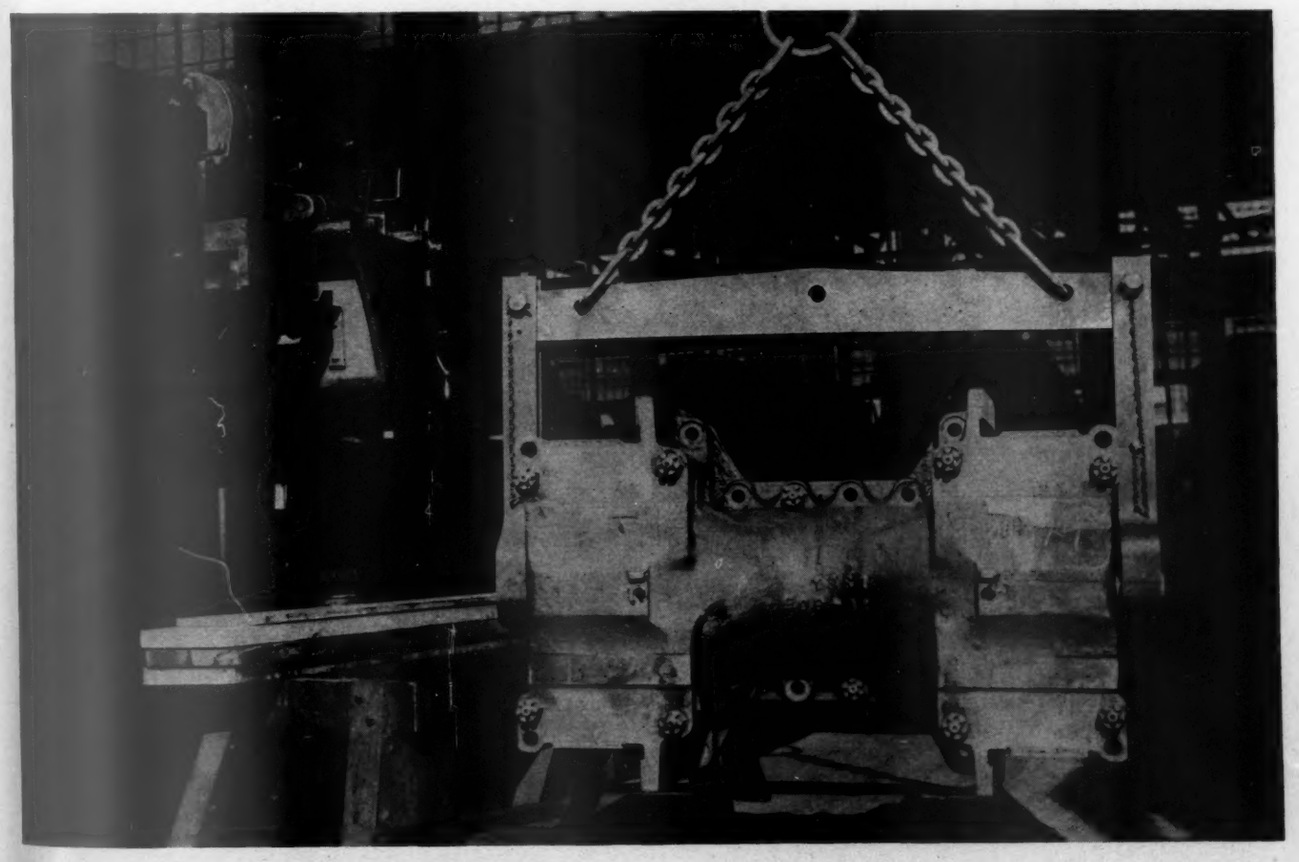


Rack for storing and checking the location of air tools

Grinding Hardened Shoe Faces

The grinding of the hardened shoe faces on the driving boxes shown is done on an old planer driven by two 5-hp. motors which have been converted into grinders. The arbor in the center of the driving box is used to set up the driving box on the table so that the center of the driving box at both ends is the same distance above the table and to make sure that the box is ground so that the shoe faces are the same distance from the center of the box. This last is accomplished by drilling a $\frac{3}{16}$-in. hole at the center line of the box on the joints. Then the machinist takes the measurements at this point, using a micrometer depth gage. Care must be used in clamping the box down on the table to avoid springing. Although the driving boxes are large and heavy, inaccuracies due to springing will occur if they are not properly clamped down. Using the arrangement illustrated makes it possible to grind the two faces on one side of a box at the same time with increased accuracy and a considerable saving in time.





Top — Converted planer with grinders for finishing shoe faces of locomotive driving boxes Center — Arbor used in grinding boxes which insures maximum accuracy in machine operation Bottom — Sling for lifting boxes onto planer table and for positioning and turning boxes

Depression Experience of Value in Present Emergency

By L. M. Westerhouse,
St. Louis-San Francisco, Birmingham, Ala.

During the depression years those of us who are employed in a supervisory capacity found it necessary to take advantage of every opportunity and means to economize on material and labor in order to stay within our budget.

In the scrapping of obsolete equipment it was possible to salvage much material that could be used again. Speaking specifically of locomotive tires, there are various condemning limits for driving tires, due to the different classes of service and sizes of locomotives. This makes it necessary to change the tires on some classes of power more often than on others but, on the other hand, the tires removed can be used again on other power until they have reached a final condemning limit. In some cases it has been possible to use a set of tires having a larger outside diameter than the original specifications for the locomotive in order to get longer service.

How to Save Tire Metal

In the re-turning of driving tires, valuable material can be saved by culling out from a set one or two tires that have a badly worn flange and replacing them. The life of driving tires can be greatly prolonged by using proper care in locating the main centers when laying off the shoes and the wedges, thereby eliminating causes for flange cutting, and by providing and maintaining some form of flange lubrication on the flanges of the leading wheels. Considerable material may be saved by accumulating an assortment of various sizes and thicknesses of used tires. This is possible by replacing a set of worn tires which has had one or two turnings with new tires, using the old tires for replacements and in matching up other sets. By accumulating all old tires of various thicknesses the tires can be classified and held for individual replacements. The larger the stock to chose from the less service material need be removed in returning the tires for various replacements.

This plan is more or less applicable with various types of truck wheels.

Provide Generous Fillets—Avoid Tool Marks

The provision of generous fillets and the elimination of tool marks is an important subject. This offers a good field for extending the life of various parts and aids greatly in avoiding failures from progressive fractures. An example of this is the elimination of the shoulder from the crosshead end of a piston rod by having the bore of the crosshead piston-rod fit considerably larger than the body of the rod and having all of the fit within the crosshead. Then a large radius extending from the fit to the body of the rod distributes the vibrations over a greater area and along the body of the rod.

Step-Size Suggestions

Material and labor can be saved by constructing the wearing parts of piston rods, crank pins and axles slightly oversize on the original application and then using these parts on smaller power or in other places when it has finally reached the condemning limit. There is also an advantage in having a variation in the size of the crank pins and rod eyes on one side of the locomotive from the other, in order that bushings on one side when worn to the limit, can again be used on the other side. However, the same results can be obtained by having a wide range of condemning limits on pins and rod eyes, and then save all the bushings that will return and rebore and only use entirely new material where the most stock is required.

The reclaiming of piston valve packing rings and cylinder packing rings, especially the sectional type, has provided a profitable field for savings in material. By the use of a special clamping device many may be returned to a smaller size. In order to make this possible to the greatest extent, it is important that as much variation as possible be provided from the original size, to the condemning limit, for the bore of the bushings. This is possible by starting out the original bore of valve bushings a little under size and replacing them only when they have reached a limit whereby they can no longer be rebored. Rings that still have some stock, but have been removed because of wear or being cut, can be classified, stored and re-turned to the next size below. Thus, only entirely new rings need be used on those bushings having been bored close to the condemning limit and only the rings that have finally reached the smallest size possible need be scrapped.

Valve bull rings and cylinder bull rings may be handled in the same manner. If valves and cylinders are properly lubricated, the replacement of worn valve and cylinder packing rings can be greatly reduced and much work of reboring valve bushings and cylinders can be eliminated.

Machine Tools Important in Railroads' War Efforts

If maximum production is to be obtained existing machine tools must be maintained and supplemented by the addition of available new equipment. The following excerpts from contest papers emphasize these points.

Keep Shop Machinery Tuned Up

(1) Put machine and shop equipment in as good a condition as possible; (2) relocate machinery, when necessary, so that work may be moved through the shops with the least time and resistance; (3) discard any obsolete equipment and replace with tools of modern design, if available.—*David E. Anderson, machinist helper apprentice, Northern Pacific, St. Paul, Minn.*

Don't Let Machine Tools Run Down

Most shops have departments expressly for the purpose of maintaining shop equipment but usually it is only after machines have failed from excessive work that these departments are called in. Perhaps the old adage "A stitch in time saves nine" could be used here to remedy this situation. If an efficient inspection department could be organized that would make expert examinations of shop machinery and provide for the proverbial stitch in time, it seems that many unnecessary machine failures could be prevented, thereby greatly reducing the drain on replacement parts thus again aiding national defense. This too would be a mutual benefit and the railroad companies would avoid expensive and exceedingly slow machine tool replacements.—*L. H. Booth, assistant mechanical inspector, Chesapeake & Ohio, Richmond, Va.*

From Tires to Housekeeping

Three papers, not readily classifiable—Pooling of surplus shop facilities and shop cleanliness among suggestions offered

SEVERAL of the papers submitted in the competition were so written that they could not be readily assigned to one of the groups dealing with a single specific aspect of mechanical-department responsibility. Some discussed too many of these aspects to belong exclusively to any of them. One touched on a field in which it stands quite alone among the papers entered in the competition.

Good housekeeping in and around the shop is not a new subject. But in the very fact that it was pretty thoroughly discussed during the days when the safety movement was being developed, and is now a matter for routine treatment, lies the danger against which one author sounds a warning. What the writer of another paper proposes to accomplish by pooling surplus shop facilities has already proved helpful in a number of instances. No doubt such arrangements will continue to be developed wherever circumstances justify them.

Wearing Qualities of Road Locomotive Tires

Studies made of performance of several groups of locomotives show influence of carbon content on service life

By C. P. Brooks,

Melrose, Mass.

The following data are a brief study of the carbon content of locomotive driving tires and how, by selecting tires with a higher carbon content and without subtracting from the safety factor, more mileage and less frequent turnings on account of tread wear may be obtained from a set of tires.

The characteristics of the locomotive from which the data were obtained are set forth in Table I. There were nine of the 4-6-2 passenger locomotives, four with Grade A tires with a carbon content of 57 to 59 carbon and five with Grade B tires with 71 to 73 points carbon. These locomotives will be referred to as the "P" class. Five of the 2-8-4 type freight locomotives were studied, two with Grade B tires with 72 to 75 points carbon and three with Grade C tires with 75 to 77 points carbon. These locomotives will be referred to as the "T" class.

Table I — Characteristics of Locomotives on Which the Tire Wear Was Studied

	4-6-2 Passenger	2-8-4 Freight
Wheel diameter, in.	80	63
Total weight on drivers, lb.	210,000	253,000
Average weight per axle, lb.	70,000	63,250

A study was made of four P class locomotives equipped with Grade A tires. The carbon content ranged from 57 to 59, placing them well within the Grade A class. At the time of tire renewal on these particular locomotives, the tires had run up an average of 189,655 mi. per locomotive.

A comparative study was made of five P class locomotives equipped with tires having the higher carbon range, which placed them in the higher ranges of Grade B and the lower ranges of Grade C. At the time this study was made, these tires had run up an average of 148,300 miles per locomotive, and the tires still had an average of 5/8 in. of surface metal before reaching limit of last turning. Note that the miles per unit of tread wear of the Grade B tires on these locomotives is 215 percent greater than that of the Grade A tires.

Table II—Summary of P Class Locomotive Tire Performance

Grade of tire	A	B
Carbon content	57 to 59	71 to 73
Original thickness, in.	3 3/8	3 3/8
Average wear when removed or studied, in.	1 1/8	23/32
Average mileage	189,653	148,290
Miles per 1/32 in. of tread wear	5,270	11,410

A study was made of two T class locomotives equipped with tires having a carbon range of from 72 to 75, placing them in the higher ranges of Grade B and the lower ranges of Grade C. At the time of renewal, these tires had run up an average of 47,756 mi. per locomotive.

The other T class locomotives were equipped with

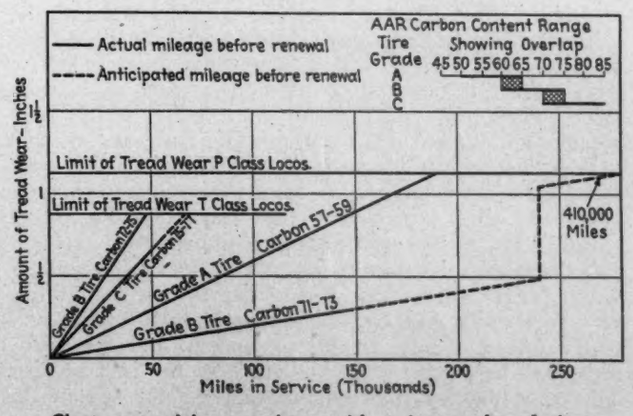


Chart summarizing experience with various grades of tires

Table III — Summary of T Class Locomotive Tire Performance

Grade of tire	B	C
Carbon content	72-75	75-78
Original thickness, in.	3 1/4	3 1/4
Average wear when removed or studied, in.	7/8	3/4
Average mileage	47,756	56,900
Miles per 1/32 in. of tread wear	1,700	2,310

tires within the Grade C group. At the time this study was made, these tires had run up an average of 56,900 mi. per locomotive, and the tires still had an average of 1/8 in. of surface metal before reaching limit of last turning. The miles per unit of tread wear of the Grade C tires on these locomotives is 136 percent greater than that of the Grade B tires.

Throughout this paper, flange wear has been discounted as depending on other variables. All surface metal removed, on the tires studied, during reforming operations has been accounted for in the rate of tread wear.

Emergency Requires Full Use of Present Equipment

Pool surplus equipment and shop facilities—Share ideas

By W. T. Clark

The mechanical departments of the railroads of the United States and Canada are facing an emergency. As a vital unit in the national defense program, the railroads must meet the heaviest tonnage demands in their history with the equipment they now have and the additions to it that can be obtained under permitted priority orders.

The railroads have just passed through a decade of lean years, during which every possible operating economy was employed. Many shops have obsolete and worn machine tools which need replacement. There are enginehouses and shops too small properly to handle the motive power coming into these terminals. Engines are being turned on wyes, because the turntables are too small. Car repair tracks are often undermanned and without adequate equipment to handle repair work promptly. There are shortages of engines and cars.

The men of the mechanical departments, because of these conditions, are presented with a tremendous responsibility and they are the ones who must devise the ways of handling the emergency. The railways of the North American continent are a closely interlocked system of transportation. If any unit of this system fails, it will affect the performance of the whole system. Because of this condition we have a joint interest, and to get the results that we must have, we will have to work together. Let us put our own house in order this time. The last time some one else took over the job, the results were not very desirable from anyone's viewpoint.

Pool Surplus Equipment and Shop Facilities

Divide the country into several convenient districts, similar to the present Interstate Commerce Commission set-up, and form a committee in each district made up of representatives from the roads in that district. Have each road supply information on all serviceable equipment, and all equipment that can be made serviceable within a reasonable period of time. Also, have each road list their requirements at the present time, and what they believe they must plan for in the future. Each road will also give information as to its shop capacity, the present output of its shops, and the work that could be done if necessary. The committees will work out a plan by which a fair return will be paid to the owner of any surplus equipment, and the equipment will be placed where it will give the best service. The same method may be followed for the use of the extra shop facilities that may be available. By this arrangement idle equipment could be put to work at once.

These district committees could also serve as a means of distributing information relative to the shop practices employed in the different shops of their territory. One shop may have a new kink on straightening steel car ends, or handling mounted wheels. Another may have a method of handling and servicing engines that will save valuable minutes. Let this kind of information be made available to all in our industry, for there are very few of us who cannot learn something from others.

This plan presents a number of difficulties which will mean much work for management and there will be details to work out to satisfy all concerned, but it can be made to work with benefit to all if properly handled.

Increase Locomotive Mileage

After the best possible distribution of the available equipment has been made, we must take the steps necessary to get every possible mile from each unit. There are roads that are now getting from 7,000 to 9,000 miles per month from modern freight power, and a performance closely approaching this figure from engines 20 to 25 years old that have been modernized. Such a performance as this is no happy accident, but is the result of careful planning by capable supervisors. To get a locomotive mileage of this standard the crews handling the equipment must be thoroughly trained to get peak performance from their engines; the enginehouse crews must be drilled to cut handling time to a minimum; and the engines must be properly maintained.

When the mileage performance mentioned above is compared with the average engine performance the country over, it is clearly apparent that we are not getting the mileage possible with the equipment we now have, and if the proper steps are taken to obtain this available mileage, the present emergency will be greatly relieved.

To get comparable mileage from older power, the tenders of most of them must be rebuilt for greater coal and water capacity; they should be equipped with mechanical lubricators; and the valve and driving gear should be fitted with pressure-type lubrication to make long runs possible. If the pressing need and the results that can be obtained by the use of the material is presented to the authorities controlling the distribution of critical materials, it should be possible to get supplies for this work. The methods employed to get high mileage performance are no secret. The means used by different roads have often been discussed at the various

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mechanical conventions, and many articles on the subject have been given in the *Railway Mechanical Engineer*. The methods used are governed by local conditions and traffic demands, and must be worked out by the supervisors in charge.

Better Training and Cooperation Required

To get high locomotive performance and mileage, there must be thoroughly trained crews handling the equipment on the road, and servicing the equipment at the terminals. The importance of personnel training in any program of improved performance cannot be emphasized too much. On any division train sheet you may choose to check, you will find certain engine crews giving a consistently better performance than the average in time and train handling. If you ride with these crews, you will find two men who thoroughly understand their engine and their duties. You will find two men working together as a team.

Monthly meetings held with as many enginemen and firemen as can attend have been found of much help in improving performance on one mid-western railroad division. The meetings are usually spaced over two days with two meetings each day. Mechanical troubles, and good and poor train performance experienced by the men are talked over. Everyone has the privilege of talking, and ways and methods are discussed of how these mechanical troubles and poor train performances could have been avoided. At these meetings, supervisors of different departments, air brake, boiler, and mechanical, give talks on handling equipment, and explain the operation and possibilities of new equipment.

That this method is producing results is clearly shown on the records. Thirty new firemen have been added to the roster in the past nine months and this division's fuel performance is the best of any on the system, and there has not been a steam failure caused by these new firemen. The draft-gear failure record of this division is one of the best of the system. The motive power used ranges from 30-year-old hand-fired to the latest type modern locomotives. This method means extra work for the engine and mechanical supervisors, but very gratifying results can be obtained by its use. For if we are to get the performance on the road that we must have, there must be an intensive campaign of education in their duties for both the old and new engine employees. Enginemen must make better time and handle their trains more smoothly. Firemen must do a better job on the road and bring in better fires which helps to cut engine handling time at the terminals. By better time on the road and quicker handling at the terminals we save minutes, and every additional minute an engine is available for service is the equivalent of another engine for that length of time.

We now have better engines and cars on our drawing boards, and there are now machine tools developed with much greater capacity than our present shop equipment. If we could get this equipment in the amounts we need, there would be no emergency. But the job must be done with what we now have.

Shop Cleanliness Increases Production

Good housekeeping pays dividends in materials — in full utilization of facilities—in decreasing time losses due to accidents

By W. A. Faris,

Material inspector, Norfolk & Western, Roanoke, Va.

During these days of national emergency we are all under pressure to do more and more work. In most cases, new machinery and additional skilled personnel are not available, even when budgets would permit their use.

One tendency under these circumstances is to permit our housekeeping to lapse because we are just too busy to keep things properly cleaned up. Our usual janitor force is being pushed into service on other jobs, and we just don't feel that we have time to clean up the ever-increasing amount of waste that speeded-up production forces on us. It is very easy to push that little bit of trash back into a corner, to set that new bushing over into the edge of the aisle, to drop that old bolt or piece of pipe on the floor, rather than to see that they go where they belong at the moment. Soon our poor housekeeping becomes a habit; we walk through our shop stepping over material without thinking about it and wondering where we will have to start looking to find the odd size tool that we now need and should have returned to the toolroom last week.

Is it really economy in the long run to neglect the apparently less important task of keeping things in order? All the experience that we have had points to one conclusion; that, other things being equal, the shop that is kept clean and orderly does more work, does better work and is a much safer shop in which to work than one that permits its housekeeping to become careless.

One outstanding example of the advantages to be gained by maintaining a clean place to work may be found in the sharp contrast between two steel plants in the same area. They are close enough together so that most conditions outside of the actual control of the plant, such as the availability of raw materials, markets, skilled labor, etc., are readily comparable. One company keeps its whole plant, buildings, grounds and machinery in good order. The other does not. The first plant has only about 45 per cent of the potential capacity of the second, yet its production is 60 per cent as high. On a basis of equal capacity its production is one-third more. Yet the type of material produced is the same and the quality is as good or better. It cannot be assumed that good housekeeping makes the whole difference, but it is an important factor in the difference.

Good housekeeping is not expensive. Unskilled labor is still readily available in spite of the acute shortage of skilled workers. A few extra janitors and a little extra help in the stores department and internal transportation systems can work wonders in keeping a shop clean and orderly, not only in keeping floors free of trash but in moving materials to and from machines in a steady stream, influencing the quantity and quality of production out of all proportions to their cost.

High Spots in

Railway Affairs . . .

Air Traffic in 1941

According to the Civil Aeronautics Administration of the Department of Commerce, domestic air lines in 1941 carried 3,768,892 revenue passengers, an increase of 38.16 per cent over the previous year. The average passenger air trip was somewhat shorter, since the revenue passenger-miles flown were up only 31.54 per cent. During 1941 19,209,671 lb. of express were carried, an increase of 53.6 per cent above 1940.

Steel Priority for Pipe Line Refused

Petroleum Co-ordinator Ickes is determined, if at all possible, to build a 24-inch crude oil pipe line from the East Texas fields to the refining area on the east coast. Although he has twice been turned down for priorities for steel pipe for such a line, he again took the matter up with the War Production Board. It turned thumbs down on the proposition, because it decided that "the value of the pipe line as a defense project was not great enough to justify the high priority ratings that would be necessary."

Ton-Miles Per Minute

The Bureau of Railway Economics, Association of American Railroads, points out that in 1941 the railroads of the United States moved an average of 904,000 tons of revenue freight one mile every minute in the year. In the month of October, when traffic was at its height, 1,069,000 tons were moved a mile every minute. It is said that this is the heaviest volume of freight traffic ever handled by the railroads in any year, exceeding the previous record established in 1929 by 6.2 per cent. "If materials for construction of new freight cars and locomotives and for maintenance purposes can be obtained," states the Bureau, "the railroads are confident of their ability to meet military and civilian transportation demands."

Pullman Rate Increase

The Interstate Commerce Commission on March 13 granted in full the application of the Pullman Company for authority to make a 10 per cent increase in sleeping and parlor car fares and charges. The decision includes a rule for the disposition of fractions, which will permit adding of amounts necessary to make all fares end in multiples of five cents. Commissioner Mahaffie criticized the free transportation policies of the railroads, but Commissioner Patterson felt that the officers and employees were fully entitled to such consideration.

Government Travel Expenses

Some of the newspaper columnists have been critical of the large amount of travel allowances made to the members of Congress. Now we find Senator McKellar, Democrat, of Tennessee, criticizing the executive departments of the government for their "utterly astonishing" travel expenditures. These, he pointed out, totaled $147,896,385 last year. He criticized the government employees for "using up the space on our trains, using cars and tires, getting a per diem, while they are traveling de luxe all over the country." He also stated that the Civilian Conservation Corps had spent $11,770,000 for travel.

Cunningham Heads The Research Study

The Transportation Board of Investigation and Research has planned for a series of studies of the relative economy and fitness of the various modes of transportation. William J. Cunningham, the James J. Hill Professor of Transportation at the Harvard Graduate School of Business Administration, has been appointed director of these studies. He is widely and favorably known among railroad men because of his leadership in the Department of Transportation at Harvard since 1916, and also for his service with a number of railroads, dating back to 1892. He was also assistant director of operation for the United States Railroad Administration during 1918-19.

Freight Rates Increased

The Interstate Commerce Commission on March 2 authorized an increase in freight rates and charges which, it is anticipated, will yield $203,000,000, or considerably less than the railroads had requested. It will be recalled that this increase is intended to offset the wage increases which were granted to the employees last fall. In its report the Commission did say that, "We have long felt the imposition of land grant deductions was unfair and that the main objective of the original grants long ago had been met so thoroughly that now it is equitable that the government should pay the same reasonable rates for its transportation that its citizens do." That question, however, is still under consideration by Congress. The new tariffs became effective on March 18, the I. C. C. denying a petition of the Office of Price Administration for their suspension until April 15. The Office of Defense Transportation also desires some modifications in the freight rate increases. Director Joseph B. Eastman on March 17 stated that "The function of the Division of Rates of the O. D. T. is to see that rates are established via the various carriers which will expedite the free flow of commodities necessary to the war effort. Because war conditions have caused dislocations in normal traffic movements it is and will continue to be necessary to negotiate certain rates for particular movements."

Mid-Week Vacation Starts Recommended

With increased business activity and with the large number of men in the military services, the passenger facilities promise to be stretched to the very limit during the coming months. The rubber tire shortage also promises to transfer travel from the highways to the railways. Ralph Budd, president of the Chicago, Burlington & Quincy, has suggested that the overcrowding can be somewhat relieved if, instead of starting vacations on the week-end during the summer months, the vacationists will plan to do their traveling on Monday, Tuesday, Wednesday and Thursday. He also suggested that special consideration be given to late spring and early fall vacations.

Tank Cars Rolling

Petroleum Co-ordinator Ickes reported that "the tank car movement of petroleum and petroleum products to the Atlantic seaboard mounted to a new high during the week ended March 7, reaching the unprecedented total of 435,086 barrels daily." Considering the strong and critical position that he took when it was first proposed to make a larger use of tank cars to relieve the shortage of these products on the east coast, it is interesting to have him say now that this speeding up of the tank car service is perhaps "the most spectacular" of the steps that have been taken to correct the situation which became acute last summer. In June the average miles per tank car per day was 37, reaching a high of 49.1 miles in October. This speaks well for the fine work done by the Car Service Division, which has worked intimately with the Office of Petroleum Co-ordinator, the Office of Defense Transportation and the oil companies.

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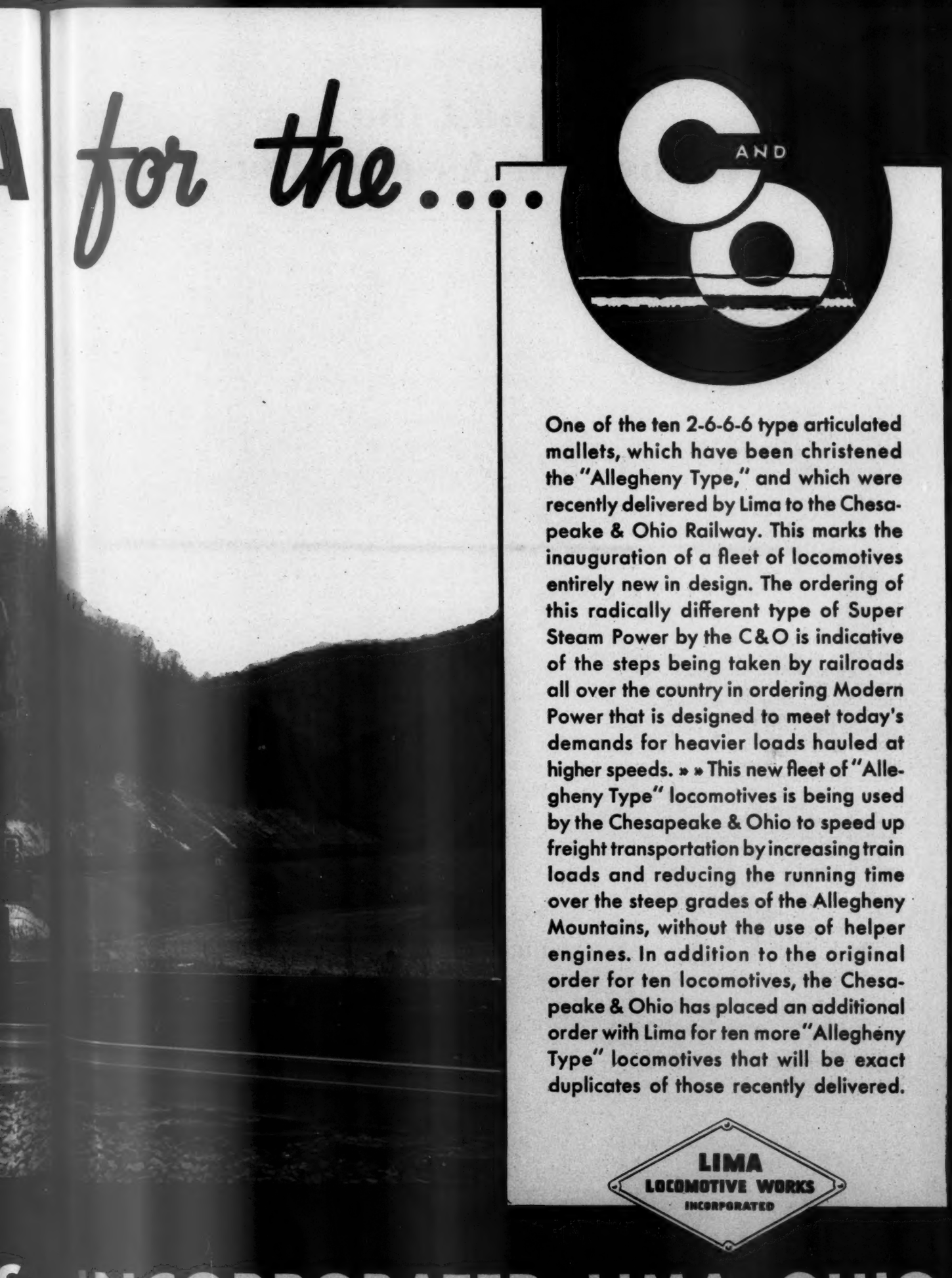
Built by LIMA

LIMA LOCOMOTIVE WORKS,



A for the....

C AND O

One of the ten 2-6-6-6 type articulated mallets, which have been christened the "Allegheny Type," and which were recently delivered by Lima to the Chesapeake & Ohio Railway. This marks the inauguration of a fleet of locomotives entirely new in design. The ordering of this radically different type of Super Steam Power by the C&O is indicative of the steps being taken by railroads all over the country in ordering Modern Power that is designed to meet today's demands for heavier loads hauled at higher speeds. » » This new fleet of "Allegheny Type" locomotives is being used by the Chesapeake & Ohio to speed up freight transportation by increasing train loads and reducing the running time over the steep grades of the Allegheny Mountains, without the use of helper engines. In addition to the original order for ten locomotives, the Chesapeake & Ohio has placed an additional order with Lima for ten more "Allegheny Type" locomotives that will be exact duplicates of those recently delivered.

LIMA
LOCOMOTIVE WORKS
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S, INCORPORATED, LIMA, OHIO

Among the Clubs and Associations

NORTHWEST LOCOMOTIVE ASSOCIATION.—Meeting held March 16. Speaker: R. M. Cincoski, boiler foreman, Northern Pacific. Subject: Locomotive Boilers.

NORTHWEST CAR MEN'S ASSOCIATION.—Meeting April 6 at 8 p. m. at the Midway Club, St. Paul, Minn. Speaker: B. W. Locke. Subject: Manufacture and Use of Waste.

CAR FOREMEN'S ASSOCIATION OF CHICAGO.—Meeting April 13 at 8 p. m. at the La Salle Hotel, Chicago. Dinner at 7 p. m. Speaker: Goodrich Q. Lewis, chief engineer, W. H. Miner. Subject: Draft Gear Maintenance.

CANADIAN RAILWAY CLUB.—Meeting April 13 at 8:15 at the Windsor Hotel, Montreal. Speaker: R. A. Carr, vice-president, Dearborn Chemical Company. Subject: The Behavior of Water in a Locomotive Boiler. Illustrations.

PACIFIC RAILWAY CLUB.—Meeting April 9 at 7:30 p. m. at the Transportation Club, Los Angeles, Calif. Speaker: R. M. Ostermann, vice-president, Superheater Company. Subject: "Has Steam Still a Future in Rail Transport?"

RAILWAY FUEL & TRAVELING ENGINEERS ASSOCIATION.—At a combined Executive and Advisory Committee meeting of the Railway Fuel & Traveling Engineers' Association at the Hotel Sherman, Chicago, on March 9, W. R. Sugg, superintendent of fuel conservation and lubrication, of the Missouri Pacific, with headquarters at St. Louis, Mo., was appointed vice-president in place of J. A. Burke, supervisor of air brakes, Atchison, Topeka & Santa Fe, who passed away early in February. Mr. Sugg was replaced on the Executive committee by G. B. Curtis, road foreman of engines, Richmond, Fredericksburg & Potomac, Richmond, Va.

RAILWAY SUPPLY MANUFACTURER'S ASSOCIATION.—Norman C. Naylor, vice-president of the American Locomotive Company, Chicago, and vice-president of the Railway Supply Manufacturer's Association, has been elected president of that association, succeeding Daniel L. Eubank, deceased. C. W. Floyd Coffin, vice-president of the Franklin Railway Supply Company, New York, chairman of the Exhibit committee and a member of the Executive committee of the association, has been elected vice-president, relieving Mr. Naylor, and R. P. Townsend, sales manager of the transportation department, Eastern region, Johns-Manville Sales Corporation, has been elected a member of the Executive committee, replacing Mr. Coffin. John D. Conway continues as secretary-treasurer.

NEW ENGLAND RAILROAD CLUB.—Meeting at the Hotel Touraine, Boston, Mass., on April 14 at 6:30 p. m. Speaker: F. W. Collins, industrial commissioner, Canadian Pacific. Subject: The Contribution of a Railway in the Building of a Nation.

A. A. R. Mechanical Division Annual Meeting Deferred

IN VIEW of present conditions it has been decided that there will be no annual meeting of the A. A. R. Mechanical Division for the year 1942. The various committees of the division are active in handling matters requiring attention, particularly those matters relating to the war effort. As fast as recommendations are proposed by the various committees they will be placed before the General committee and required action taken. Where necessary, they will be referred to the members by letter ballot.

As recommendations from the committees are approved, appropriate circulars or circular letters will be issued to the members. It is urged that any members having matters which require association attention should refer them to the secretary.

Sorenson Becomes Assistant to C. H. Buford

AUGUST L. SORENSON, manager of stores of the Erie, with headquarters at Hornell, N. Y., has been appointed assistant to the vice-president, operations and maintenance department of the Association of American Railroads, with headquarters at Washington, D. C.

DIRECTORY

The following list gives names of secretaries, dates of next regular meetings, and places of meetings of mechanical associations and railroad clubs:

ALLIED RAILWAY SUPPLY ASSOCIATION.—J. F. Gettrust, P. O. Box 5522, Chicago.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS

AMERICAN SOCIETY OF MECHANICAL ENGINEERS.—C. E. Davies, 29 West Thirty-ninth street, New York. Annual meeting Hotel Astor, New York, December 1-5.

RAILROAD DIVISION.—E. L. Woodward, *Railway Mechanical Engineer*, 105 West Adams street, Chicago.

ANTHRACITE VALLEY CAR FOREMEN'S ASSN.—Frank Kramer, 412 Hill street, Duryea, Pa. Meets third Monday of each month at Wilkes-Barre, Pa.

ASSOCIATION OF AMERICAN RAILROADS.—Charles H. Buford, vice-president Operations and Maintenance Department, Transportation Building, Washington, D. C.

OPERATING SECTION.—J. C. Caviston, 30 Vesey street, New York.

MECHANICAL DIVISION.—A. C. Browning, 59 East Van Buren street, Chicago.

PURCHASES AND STORES DIVISION.—W. J. Farrell, 30 Vesey street, New York.

MOTOR TRANSPORT DIVISION.—George M. Campbell, Transportation Building, Washington, D. C.

CANADIAN RAILWAY CLUB.—C. R. Crook, 4415 Marcil avenue, N. D. G., Montreal, Que. Regular meetings, second Monday of each month, except June, July and August, at Windsor Hotel, Montreal, Que.

CAR DEPARTMENT ASSOCIATION OF ST. LOUIS.—J. J. Sheehan, 1101 Missouri Pacific Bldg., St. Louis, Mo. Regular monthly meetings third Tuesday of each month, except June, July and August, DeSoto Hotel, St. Louis.

CAR DEPARTMENT OFFICERS' ASSOCIATION.—Frank Kartheiser, chief clerk, Mechanical Dept. C. B. & Q., Chicago.

CAR FOREMEN'S ASSOCIATION OF CHICAGO.—G. K. Oliver, 8238 S. Campbell avenue, Chicago. Regular meetings, second Monday in each month, except June, July and August, La Salle Hotel, Chicago.

CAR FOREMEN'S ASSOCIATION OF OMAHA, COUNCIL BLUFFS AND SOUTH OMAHA INTERCHANGE.—H. E. Moran, Chicago Great Western, Council Bluffs, Ia. Regular meetings, second Thursday of each month.

CENTRAL RAILWAY CLUB OF BUFFALO.—Mrs. M. D. Reed, Room 1840-2, Hotel Statler, Buffalo, N. Y. Regular meetings, second Thursday of each month, except June, July and August, at Hotel Statler, Buffalo.

EASTERN CAR FOREMAN'S ASSOCIATION.—W. P. Dizard, 30 Church street, New York. Regular meetings, second Friday of January, February (annual dinner), March, April, May, October, and November at Engineering Societies Bldg., 29 West Thirty-ninth street, New York.

INDIANAPOLIS CAR INSPECTION ASSOCIATION.—H. T. Bramblet, care of H. P. Ruck, car foreman, Pennsylvania, 764 South Emerson avenue, Indianapolis, Ind. Regular meetings, first Monday of each month, except July, August and September, in Indianapolis Union Station, Indianapolis, at 7 p. m.

LOCOMOTIVE MAINTENANCE OFFICERS' ASSOCIATION.—Secretary-treasurer C. M. Lipscomb, Missouri Pacific, North Little Rock, Ark.

MASTER BOILER MAKERS' ASSOCIATION.—A. F. Stiglmeier, secretary, 29 Parkwood street, Albany, N. Y.

MIDWEST AIR BRAKE CLUB.—C. F. Davidson, secretary-treasurer, general inspector car department, St. L.-S. F., Springfield, Mo.

NEW ENGLAND RAILROAD CLUB.—W. E. Cade, Jr., 683 Atlantic avenue, Boston, Mass. Regular meetings second Tuesday in each month, except June, July, August and September.

NEW YORK RAILROAD CLUB.—D. W. Pye, Room 527, 30 Church street, New York. Meetings, third Thursday in each month, except June, July, August, September and December at 29 West Thirty-ninth street, New York.

NORTHWEST CAR MEN'S ASSOCIATION.—E. N. Myers, chief interchange inspector, Minnesota Transfer Railway, St. Paul, Minn. Meetings first Monday each month, except June, July and August, at Midway Club rooms, 1931 University avenue, St. Paul.

NORTHWEST LOCOMOTIVE ASSOCIATION.—G. T. Gardell, 820 Northern Pacific Building, St. Paul, Minn. Meetings third Monday of each month, except June, July and August.

PACIFIC RAILWAY CLUB.—William S. Wollner, P. O. Box A, Sausalito, Calif. Monthly meetings alternately in northern and southern California.

RAILWAY CLUB OF PITTSBURGH.—J. D. Conway, 1647 Oliver Building, Pittsburgh, Pa. Regular meetings, fourth Thursday in month except June, July and August, Fort Pitt Hotel, Pittsburgh, Pa.

RAILWAY FUEL AND TRAVELING ENGINEER' ASSOCIATION.—T. Duff Smith, Room 811, Utilities Building, 327 South La Salle street, Chicago.

RAILWAY SUPPLY MANUFACTURERS' ASSOCIATION.—J. D. Conway, 1941 Oliver Building, Pittsburgh, Pa.

SOUTHERN AND SOUTHWESTERN RAILWAY CLUB.—A. T. Miller, P. O. Box 1205, Atlanta, Ga. Regular meetings, third Thursday in January, March, May, July and September. Annual meeting, third Thursday in November, Ansley Hotel, Atlanta, Ga.

TORONTO RAILWAY CLUB.—D. M. George, Box 8, Terminal A, Toronto, Ont. Meetings, fourth Monday of each month, except June, July, and August at Royal York Hotel, Toronto.

WESTERN RAILWAY CLUB.—E. E. Thulin, executive secretary, Room 822, 310 South Michigan avenue, Chicago. Regular meetings, third Monday in each month, except June, July, August, September, and January.

NEWS

Young Promoted to Brigadier General

CHARLES D. YOUNG has recently been called to active duty with the Army and on March 16 was promoted from the rank of Colonel to that of Brigadier General. Brigadier General Young, a vice-president of the Pennsylvania, was serving as director of the Office of Defense Transportation's Section of Materials and Equipment, when he was called to active duty.

Steel Only for Cars of Designs Recommended by A. A. R.

ALLOCATION of freight-car steel will hereafter be recommended by the War Production Board's Transportation Equipment Branch only for the construction of cars conforming to the designs and specifications set forth in last fall's report on the Car Construction Committee of the Mechanical Division, Association of American Railroads. That report, recommending that during the emergency orders for new freight cars conform to 13 designs, was reviewed in the December, 1941, issue of the *Railway Mechanical Engineer*, page 512.

The policy is applicable "to all orders placed after the first of this year and also to such prior orders scheduled for delivery so late this year that material utilized in construction shall not already have been processed or received." On orders received prior to the first of this year for cars scheduled for delivery after April 30, Mr. Stevenson suggests that the builders "file promptly with the Branch a statement itemizing the material to be utilized in their construction which has already been processed or received."

Knowlson Outlines Plan for Change from Priorities to Allocations

ANNOUNCING "a fundamental change in the priorities system," J. S. Knowlson, director of the Division of Industry Operations, War Production Board, has revealed that between April 1 and June 30 most of the blanket preference rating orders will be revoked or allowed to expire, and companies operating under such orders will be required to apply for priority assistance in accordance with the Production Requirements Plan under which materials are allocated quarterly by quotas.

The WPB announcement stated that the "rapidly increasing materials requirements of the war program make it impractical to continue the use of preference ratings which have been assigned under existing 'P' orders to whole industries, without any exact check of the amount of material which such ratings may be used to obtain." It added that "through the Production Requirements Plan, the director of industry operations will continue to assign ratings, but the rating assigned in each case may be used to obtain only a specified quantity of materials or products."

Freight-car and locomotive builders operating under orders P-8 and P-20 have already been directed to arrange to obtain materials under the Production Requirements Plan, although P-8 and P-20 have been extended until April 30. Meanwhile, such materials as steel plates, copper and aluminum have been on an allocation basis. The new plan contemplates new limitation and conservation orders to curtail "less essential" production and "to force substitutions for scarce materials wherever possible in essential industries."

O. C. Castle Appointed to ODT

O. C. CASTLE, former superintendent of transportation of the Southern Pacific Lines in Texas and Louisiana, who retired on March 15, has been appointed assistant director of the Division of Railway Transport, Office of Defense Transportation, with headquarters in Washington, D. C.

Priority Specialists for WPB Industry Branches

PRIORITY specialists have been assigned to each of the War Production Board's industry branches to assist the branch chiefs "in the preparation of priority orders and assignment of priority ratings." Industry branches are found in WPB divisions of Materials, Production, and Industry Operations, the Transportation Branch being in the latter.

Professor Schmidt Dies

EDWARD C. SCHMIDT, who retired in 1940 as professor of railway engineering and head of the department of railway engineering at the University of Illinois, died on March 21 in a New York hospital after a week's illness. Mr. Schmidt was born in Jersey City, N. J., on May 14, 1874, and graduated from the Stevens Institute of Technology in 1895, then going with the Kalbfleisch Chemical Company of New York and Buffalo, N. Y. In 1896 he designed conveying machinery for the C. W. Hunt Company, New York, and in 1897 became assistant to the mechanical engineer, steam department of the Edison Electric Illuminating Company, Brooklyn, N. Y. The following year, he went with the American Stoker Company at New York and a short time later was appointed an instructor and assistant professor in experimental and railway mechanical engineering at the University of Illinois. In 1903 he became engineer of the American Hoist & Derrick Co., and in 1904 went with the Kerr Turbine Co., Wellsville, N. Y., as engineer of tests. Mr. Schmidt returned to the University of Illinois in 1906 as head of the department of railway engineering. During the first World War he served as a major in the army ordnance department on detached service with the United States Fuel Administration and the United States Railroad Administration and in 1919 became staff mechanical engineer of the North American Company. In 1921 he returned to the University of Illinois as professor of railway engineering and head of that department. Mr. Schmidt had been active in the American Society of Mechanical Engineers for many years and served as chairman of the executive committee, Fuels division, in 1925 and 1926; chairman of the committee on Locomotive Test Codes in 1927; and chairman of the executive committee, Railroad division, in 1937 and 1938. He has also been active in the American Railway Engineering Association and served as chairman of the committee on the Economics of Railway Location in 1922 and 1923.

Hollar Heads ODT Material Section

PHILIP A. HOLLAR, special representative of the Operations and Maintenance Department of the Association of American Railroads and former-assistant stores manager of the Pennsylvania, has been appointed acting director of the Office of Defense Transportation's Section of Materials and Equipment. He succeeds Colonel Charles D. Young who has been called to active duty with the Army.

Along with Mr. Hollar's appointment, Director Eastman also announced the appointments of Carroll W. Brown as assistant to the Director of the Materials and Equipment Section; and of eight consultants who will advise Mr. Hollar on technical matters pertaining to materials and equipment for various branches of the transportation industry. Mr. Brown served on the staff of the Federal Coordinator of Transportation as assistant director of the Section of Property and Equipment, and he has recently been employed as an equipment engineer on construction work at the Ravenna, Ohio, ordnance plant.

The eight consultants and the matters on which they will advise are as follows: F. H. Hardin, president of the Association of Manufacturers of Chilled Car Wheels—railroad freight, passenger, and all other types of cars; J. G. Bower, formerly Eastern representative of the Buckeye Steel Castings Company—castings and miscellaneous items required in rail transportation, manufacture and maintenance; Charles T. Ripley, chief engineer, Technical Board of the Wrought Steel Wheel Industry—steam, Diesel, and electric locomotives; H. L. Hamilton, manager of the Electro-Mo-

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33 1/3% increase in T

(WITHOUT INCREASING THE SIZE OF THE LOCOMOTIVE)

by application of..

The steam locomotive is possessed of latent power which now can be released by The Franklin System of Steam Distribution. This system, which is applicable to existing as well as new steam locomotives, is the result of years of experimentation, research and road tests and is offered to the railroads as a means of increasing train speed and load capacity without increasing the size of the locomotive.

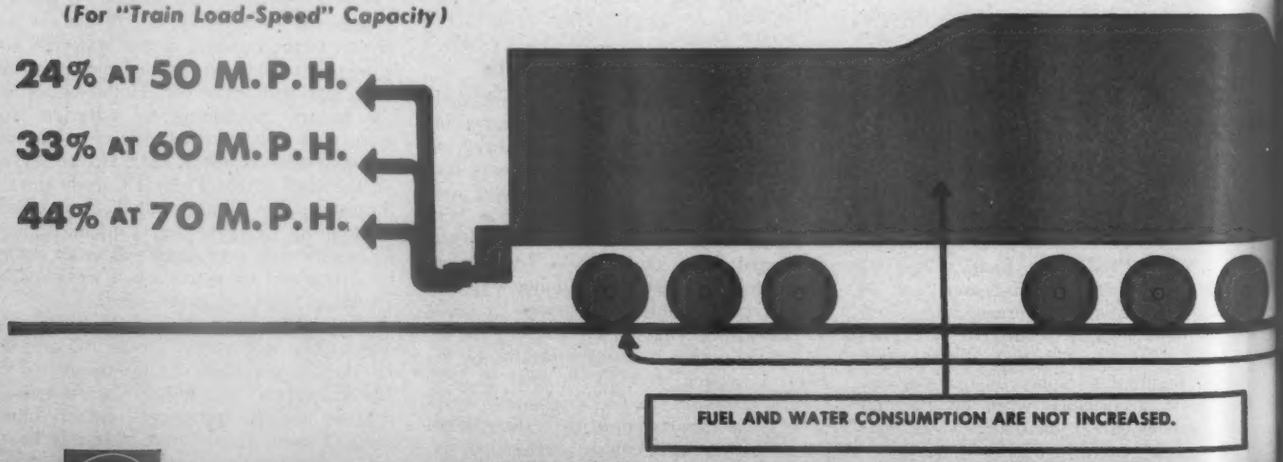
INCREASED DRAWBAR HORSEPOWER

(For "Train Load-Speed" Capacity)

24% AT 50 M.P.H.

33% AT 60 M.P.H.

44% AT 70 M.P.H.



FUEL AND WATER CONSUMPTION ARE NOT INCREASED.

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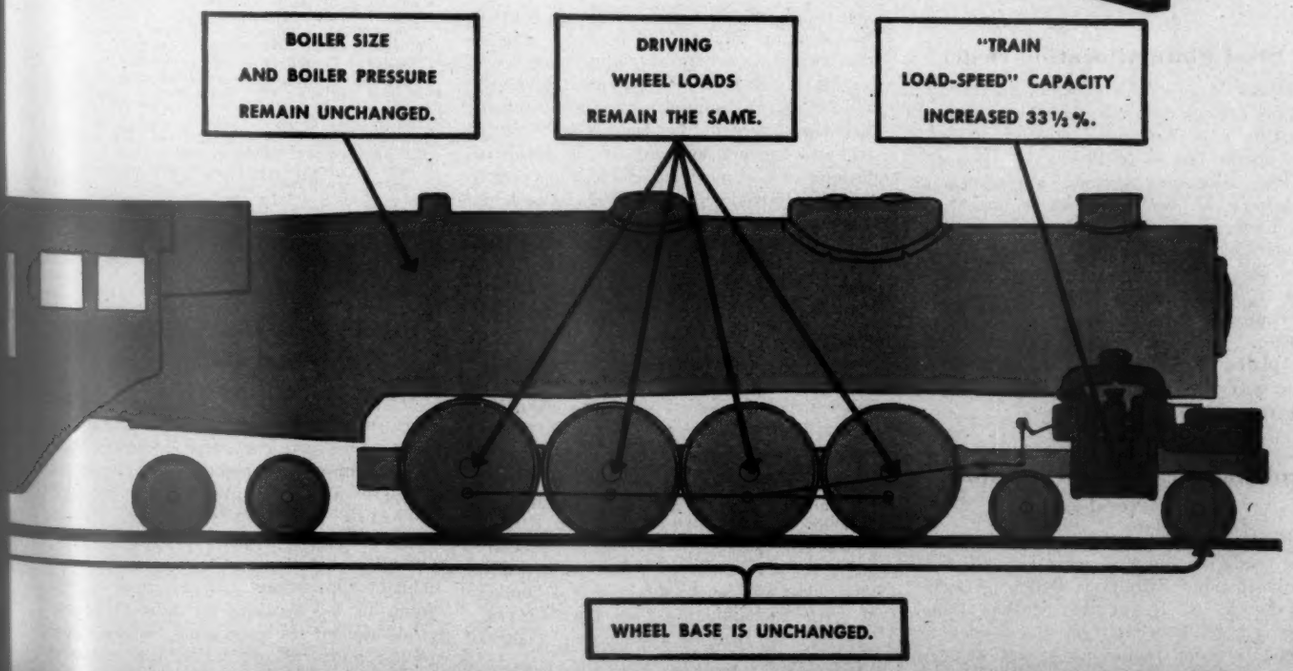

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tive Division of the General Motors Corporation—Diesel engines for railroad propulsion equipment; Irving B. Babcock, president and general manager of the General Motors Truck Corporation—buses, trucks, taxicabs, and replacement parts; Harold C. Davis, vice-president of Consolidated Motor Lines, Inc.—equipment and supplies for maintenance of buses and trucks; Robert F. Black, president of the White Motor Company — equipment on which production has been suspended, including buses, trucks, fire-fighting apparatus, road work equipment, and work equipment for public utilities and communications companies; A. L. Viles, president of the Rubber Manufacturers Association, Inc., and chairman of the buying committee of the Rubber Reserve Company, affiliate of the Reconstruction Finance Corporation —rubber products, including tires, tubes, insulated wire, and belting and other mechanical rubber goods.

Copper for Railroad Maintenance

THE use of copper for "essential operating parts and essential maintenance and repair parts" for railway locomotives, cars and equipment will be permitted under an amendment to Order M-9-c issued March 2 by the Director of Industry Operations. The amendment adds railroad uses to List "B" of the Order, which permits the use of copper where the use of less scarce material is impractical.

An official interpretation shortly will be issued by the Copper Branch, War Production Board, to guide railroads in the uses for which copper will be permitted.

Steel Plate Allocation Order

ORDER M-21-c which formalizes the allocation system on steel plates has been issued by J. S. Knowlson, director of industry operations, War Production Board.

The allocation system, announced on February 17, was outlined in the March *Railway Mechanical Engineer*, page 125. Under it plate allocations have been carried out under General Allocations Order No. 1, which now is changed to M-21-c to conform to the general system of numbering. The order changes the definition of plates to include stainless steel but otherwise follows the plate allocation and reporting system now in force.

Probable Traffic and Equipment Needs

PRESIDENTS and other executives of member roads of the Association of American Railroads met with J. J. Pelley, president of the A. A. R., at the Stevens Hotel, Chicago, on February 27, to consider the probable traffic requirements and the general equipment outlook for the railroads during the coming year. The discussion indicated that, with the co-operation of authorities at Washington in making materials available for the construction of cars and locomotives, the railroads expect to handle successfully all war traffic which may be offered. It is anticipated that 113,000 new freight cars will be delivered to the railroads by October 1, thereby increasing the total number of serviceable cars to 1,692,000, or more than enough to handle a peak fall movement of 1,000,000 car loads a week.

Conversion of Locomotive Plants

THE War Production Board is considering a question raised by locomotive builders as to how much capacity they should hold in readiness to meet the requirements of the Office of Defense Transportation while they proceed with their plant-conversion programs. This was revealed by J. S. Knowlson, director of WPB's Division of Industry Operations, in his discussion of conversion at a February 24 press conference.

Citing the locomotive builders' problem as a typical problem of conversion, Mr. Knowlson said that they have an A-3 priority and they have to give preference to Army and Navy orders. He conceded, however, that locomotives, too, are essential to the war effort; and thus WPB is working on the industry's aforementioned query.

C. Vanderbilt, Engineer, Dies at 68

BRIGADIER General Cornelius Vanderbilt, a member of the famous railroad "dynasty" and a mechanical engineer who developed a new fire box and a special tender design, died on his yacht at Miami, Fla., on March 1, at the age of 68. Born the great-grandson of Cornelius Vanderbilt who built up the New York Central system and originated the family's great railroad holdings, General Vanderbilt early showed a great fondness for the railroad business and an aptitude for mechanical engineering. Receiving his B.A. degree at Yale University in 1895, he was apprenticed to the mechanical department of the New York Central and was engaged in many of the advanced designs of locomotives which the Central was then introducing. In 1897, he took up a scientific graduate course at Yale, receiving his Ph.B. in 1898 and M.E. in 1899. For a few months thereafter he worked in the civil engineering department of the road, being forced to give up direct railroad employment upon the death of his father.

In 1899 General Vanderbilt patented a boiler which embodied a corrugated, cylindrical firebox without stays. This design was first embodied in a New York Central "ten-wheeler" built at the West Albany shops. General Vanderbilt also designed a cylindrical locomotive tender, the first of which was attached to a freight locomotive built by Baldwin for the Illinois Central in 1900. He was long a director of a number of roads, including the New York Central, Delaware & Hudson and Illinois Central.

Illinois Central Starts Big Scrap Hunt

THE Illinois Central has started a system-wide scrap hunt to round up critical materials for war use. Every mile of its lines in 14 states will be combed by scrap hunters, and all vital materials that are found which cannot be reused on the railroad will be added to shipments going into war production. The scrap hunt is being conducted by a committee of which William S. Morehead, general storekeeper, is chairman, and representatives of all material-using departments of the railroad are members.

The scrap hunters will go over the entire railroad, paying particular attention to shops, water stations, power plants, abandoned structures and obsolete machinery, seeking materials that can be put to use to win the war. All usable parts will be reclaimed and put in the critical categories, and all parts which cannot be reclaimed will be sorted out and made ready for the scrap market.

Rules for Steel Plate Consumers

CONSUMERS of steel plates have been asked by the Iron and Steel Branch, War Production Board, to conform to a list of requirements in placing orders so that all plates possible may come from continuous strip mills. The requirements are:

Edges—Universal or strip mill edge should be acceptable for all plates that can be rolled within the limits of strip mills.

Widths—Plates should be 72 in. and narrower wherever practical on account of the larger number of units available in the industry. (6 strip mills can produce plates up to 72 in. wide, 1 up to 84 in. and 3 up to 90 in.).

Gauges—Gauges should be held to a minimum number. If possible, from $^{3}/_{16}$ in. to $^{3}/_{4}$ in. use only increments of $^{1}/_{32}$ in.; and from $^{3}/_{4}$ in. to 1½ in. increments of $^{1}/_{16}$ in. Most strip mills can produce plates up to $^{3}/_{4}$ in. thick; some can produce thicker plates and some are confined to thinner gauges.

Lengths—To the fullest extent possible, lengths should be held to 30 ft. and under, on account of the number of mills whose maximum length is 30 ft. to 30 ft. 6 in. Multiples of short lengths desirable, but not to exceed 30 ft. 6 in.

Tonnage—A minimum of 10 tons per item for any width, gauge and length is required in order to obtain maximum strip mill production.

Marking—The marking requirements should be kept to a minimum that will properly identify the item.

Purchasing—Orders should be placed as far in advance as possible, giving full specifications and order of sequence. This should be not less than 30 days in advance of the first day of the month in which shipment is desired and preferably earlier.

Design—In designing new boats, particular attention should be given to the above requirements.

Stock—Any orders for stock material should be kept to a minimum number of widths and lengths.

Higher Preference Ratings for Repair and Maintenance Materials

HIGHER preference ratings for railroad maintenance materials and operating supplies and improved procedures in connection therewith have been provided by the War Production Board in Preference Rating Order No. P-88, issued March 17 by J. S. Knowlson, director of WPB's Division of Industry Operations. In addition to providing an A-1-a rating for delivery of materials needed for emergency repairs upon specific approval of WPB, the order in general assigns an A-3 rating to the more important maintenance and operating materials, and an A-8 to other repair parts and supplies. Under the previous set-up, all of the foregoing have had only an A-10 rating under Order P-100 which covers maintenance and operating materials for various industries.

To get the new A-1-a rating assigned to

materials needed for emergency repairs a railroad must communicate with WPB describing the material essential for emergency repair and the nature of the emergency necessitating such repair. The director of industry operations "will notify such railroad whether, and to what extent, its application is approved, and a copy of such notification shall be furnished by the railroad to its supplier to evidence the A-1-a rating."

In addition to embracing the already A-3 rated materials for freight-car and locomotive repairs, the new plan raises from A-10 to A-3 the rating on materials to be used for maintenance or repair of passenger cars, rail, track fastenings, turnouts, crossings, bridges, float bridges, turntables, signals, interlockings, centralized traffic control systems, coal and ore handling and conveying machinery, freight handling and warehousing equipment, floating equipment, wreck equipment, maintenance of way work equipment, telephone and telegraph systems, water and fueling plants, car retarders, sales, power plants, transmission systems, and shop tools and equipment; also, operating supplies necessary in the actual operation of trains, cars, or locomotives, and deliveries to the railroads of perishable tools which are consumed in the maintenance or repair of any of the above items of equipment. Raised from A-10 to A-8 are the ratings on deliveries to railroads "of other material necessary for maintenance, repair or operating supplies."

Each rating assigned to the railroad is extensible to suppliers of raw materials going into the maintenance parts involved. The order, however, sets up restrictions on both railroads and suppliers, designed to preclude the accumulation of inventories above "a practicable working minimum." Also, the order stipulates that every railroad and supplier "shall wherever possible use conservation measures such as substitution, redesign and respecification to eliminate scarce materials normally used." In that connection the director of industry operations "may from time to time require the elimination or diminution of the use of any material, with or without substitution of other materials, and may specify the use in the operation, maintenance and repair of railroads to which specific types of material can be put."

Equipment Purchasing and Modernization

Atchison, Topeka & Santa Fe.—On February 24, the directors of the Atchison, Topeka & Santa Fe approved the purchase of 10 5,400-hp. Diesel-Electric freight engines, 20 steam locomotives of the 4-8-4 type and 100 60-ft. flat cars, costing approximately $10,000,000. All of the equipment will be ordered for delivery in 1943. The Electro-Motive Corporation will build the Diesel-electric locomotives, the Baldwin Locomotive works the steam locomotives and the order for the flat cars will be awarded later.

Chicago & Eastern Illinois.—The Chicago & Eastern Illinois has been authorized by Division 4 of the Interstate Commerce Commission to assume liability for $1,200,000 of 2½ per cent equipment trust certificates, application for which was noted on page 124 of the March issue.

Chicago & Northwestern.—The Chicago & Northwestern has been authorized by Division 4 of the Interstate Commerce Commission to assume liability for the $3,750,000 of 2½ per cent equipment trust certificates, application for which was mentioned on page 125 of the March issue.

Chicago, Indianapolis & Louisville.—The 1942 budget for additions and betterments on the Chicago, Indianapolis & Louisville, calling for expenditures of $3,321,000 for road and equipment as compared to $3,859,000 in 1941, has been approved by Judge Michael L. Igoe of the Federal district court, Chicago. Of the total for 1942, $2,740,000 has been allocated for new equipment, including cars already on order; $141,000 for repairs to old equipment, and $440,000 for roadbed.

(*Continued on second left-hand page*)

Orders and Inquiries for New Equipment Placed Since the Closing of the March Issue

Locomotive Orders

Road	No. of Locos.	Type of Locos.	Builder
Atchison, Topeka & Santa Fe	10	5,400-hp. Diesel-elec.	Electro-Motive Corp.
	20	4-8-4	Baldwin Loco. Wks.
Boston & Maine	3	1,000-hp. Diesel-elec.	Electro-Motive Corp.
Delaware & Hudson[1]	15	4-8-4	American Loco. Co.
Denver & Rio Grande Western	10[2]	4-6-6-4	Baldwin Loco. Wks.
	6[2]	5,400-hp. Diesel-elec.	Electro-Motive Corp.
Lehigh Valley	5	1,000-hp. Diesel-elec.	Electro-Motive Corp.
	5	1,000-hp. Diesel-elec.	American Loco. Co.
New York, Chicago & St. Louis	10	2-8-4	Lima Loco. Wks.
Northern Pacific	10[3]	4-8-4 frt. and pass.	Baldwin Loco. Wks.
	12[3]	4-6-6-4	American Loco. Co.
	3[3]	5,400-hp. Diesel-elec.	Electro-Motive Corp.
Richmond, Fredericksburg & Potomac	10	2-8-4	Lima Loco. Wks.
St. Louis Southwestern	5	4-8-4	Company shops
Southern Pacific	30	4-8-8-2	Baldwin Loco. Wks.
	10	4-8-4	Lima Loco. Wks.
	30	1,000-hp. Diesel-elec.	American Loco. Co.
Union Pacific	30	4-6-6-4	American Loco. Co.

Locomotive Inquiries

Duluth, Missabe & Northern	10	2-8-8-4	.....
Indianapolis Union	1 or 2	0-8-0	.....

Freight-Car Orders

Road	No. of Cars	Type of Cars	Builder
American Steel & Wire Co.	65	70-ton gondola	Magor Car Corp.
Atlantic Refining Co.	8	40-ton tank	Gregg Co., Ltd.
Central of Georgia	50	50-ton hopper	Pull.-Std. Car Mfg. Co.
Chicago, Milwaukee, St. Paul & Pacific	35	70-ton hopper	Company shops
	35	70-ton gondola	Company shops
Chicago, Rock Island & Pacific	350	50-ton auto-box	Pressed Steel Car Co.
	300	50-ton flat	Company shops
	25	70-ton covered hopper	Gen. Amer. Trans. Co.
	200	40-ton auto-box	Pressed Steel Car Co.
Lehigh Valley	500	50-ton hopper	Bethlehem Steel Co.
Linde Air Products Co.	39	70-ton box	Gen. Amer. Transp. Corp.
Nashville, Chattanooga & St. Louis	250	50-ton hopper	Pull.-Std. Car Mfg. Co.
	25	50-ton box	Pull.-Std. Car Mfg. Co.
	50	50-ton gondola	Bethlehem Steel Co.
	75	70-ton gondola	Greenville Steel Car Co.
National Rys. of Mexico	500	50-ton box	Magor Car Corp.
	200	50-ton gondola	Magor Car Corp.
	70	Air-dump	Magor Car Corp.
	200	50-ton tank	American Car & Fdry. Co.
National Tube Co.	98	70-ton gondola	Magor Car Corp.
New York, Chicago & St. Louis	50	70-ton hopper	American Car & Fdry. Co.
	50	50-ton flat	Pull.-Std. Car Mfg. Co.
Richmond, Fredericksburg & Potomac	20	50-ton box	Pull.-Std. Car & Mfg. Co.
Rubber Reserve Co.	50	50-ton tank	American Car & Fdry. Co.
Union Pacific	1,000	50-ton ballast	American Car & Fdry. Co.
	1,000	50-ton gondola	Pull.-Std. Car Mfg. Co.

Freight-Car Inquiries

Atchison, Topeka & Santa Fe	100	Flat	.....
Baldwin Loco. Works	15	50-ton gondola	.....
	6	50-ton flat	.....
	5	Hopper	.....
Bessemer & Lake Erie	800	90-ton hopper	.....
Canadian National	4,000	50-ton box	.....
	250	70-ton hopper	.....
Canadian Pacific	550	50-ton box	.....
	200	40-ton box	.....
	150	75-ton ore	.....
Chicago, Indianapolis & Louisville	200	50-ton box	.....
	200	50-ton hopper	.....
	100	70-ton flat	.....
Denver & Rio Grande Western	1,000	70-ton drop-door gondola	.....
	450	50-ton flat-bottom gondola	.....
	50	70-ton mill-type gondola	.....
Duluth, Missabe & Iron Range	2,000	75-ton ore	.....
Texas & Pacific	500	50-ton box	.....

Passenger-Car Orders

Road	No. of Cars	Type of Car	Builder
National Rys. of Mexico	20	Bagg.-exp.	Magor Car Corp.

[1] Delivery expected to begin March, 1943.
[2] Order subject to approval by the court.
[3] The 25 locomotives will cost approximately $6,500,000.
[4] Orders for the 40 steam locomotives and 30 Diesel-electric switching engines to cost approximately $12,000,000. Deliveries are expected to start in October of this year. The 4-8-8-2 locomotives will be adaptable to heavy freight or passenger service. The 4-8-4's will be of the streamline "Daylight" type for passenger and fast-freight service. The 40 Diesel-electric locomotives will be for general use in the road's principal terminals.

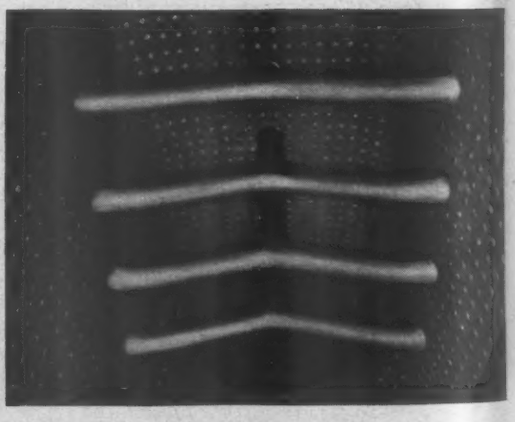
18 Million Miles

OF SUCCESSFUL OPERATION

HAVE PROVED

THE SECURITY CIRCULATOR

Security Circulators, operating on 24 railroads, have accumulated over 18 million locomotive miles, mostly in heavy, fast freight and passenger service. » » Some of these Circulator-equipped locomotives have operated over 400,000 miles. » » The Security Circulators in service have proved so successful that repeat orders are constantly being placed.



View illustrating the positioning of Security Circulators in an average size of locomotive firebox prior to installing the brick arch.

AMERICAN ARCH

Security Circulator Division

Typical Security Circulator and brick Arch Installation in a locomotive firebox. The small sectional brick are as readily applied as in an ordinary arch tube firebox.

Firebox of one of ten 4-8-4 type locomotives recently built for a mid-western road — all equipped with Security Circulators.

★ Improved Arch Support for all locomotive fireboxes

★ Adapted to any type of locomotive

★ Reduced honeycombing, flue plugging and cinder cutting

★ Improved circulation in side water legs

COMPANY, INC.

NEW YORK CHICAGO

Chicago, Milwaukee, St. Paul & Pacific.—The Milwaukee has been authorized by the district court to spend $10,529,238 for improvements in 1942. Of the total, $6,846,000 is for repairs to roadbed and equipment.

Great Northern.—Maintenance of its present plant and acquisition of new equipment will cost the Great Northern railway more than 26½ million dollars in 1942, according to the proposed maintenance, improvement and equipment program, which is contingent on the continued availability to the company of necessary materials through government priorities. By December 31, 1942, the company hopes to have in service approximately 43,400 freight cars of all types.

Equipment now on order includes 9 Diesel locomotives, which will cost approximately $2,000,000, and 1,000 50-ton box cars, construction of which will cost $3,000,000. Delivery of 2,000 50-ton box cars, ordered in 1941, has begun and is scheduled for completion by July 1. These cars will be augmented by the 1,000 box cars on this year's program. The latter equipment now is under construction in the company's shops in St. Cloud, Minn. Of the Diesel locomotives "on order," 3 will be 5,400 hp. for freight service on the Kalispell division in Montana, much of which is through the Rocky Mountains. All of the remaining 6 Diesels on order will be 1,000 hp.

Illinois Central.—The directors of the Illinois Central have approved a large locomotive and car buying program, the details of which will be announced shortly.

The Lehigh & New England is reported to be considering the purchase of new freight cars.

Pacific Fruit Express. — The Pacific Fruit Express will spend more than $21,000,000 for the purchase of new cars and the rebuilding and heavy repairs to existing equipment in 1942. The new cars, orders for which will be placed shortly, include 2,000 refrigerator cars. The rebuilding program involves 2,500 refrigerator cars which will be equipped with new bodies in company shops in 1942 and 1943. During the same period, 3,000 refrigerator cars will be given heavy repairs.

Southern Pacific. — The Southern Pacific has asked the Interstate Commerce Commission for authority to assume liability for $5,660,000 of 2½ per cent equipment trust certificates, maturing in 10 equal annual installments of $566,000 on April 1 in each of the years from 1943 to 1952, inclusive. The proceeds will be used as part of the purchase price of new equipment costing a total of $7,111,401 and consisting of 1,900 steel-sheathed, wood-lined box cars and 300 steel flat cars with wood flooring.

Tennessee Central.—This company has asked the Interstate Commerce Commission for authority to assume liability for $342,000 of 2¾ per cent equipment trust certificates, maturing in 20 semiannual installments of $18,000 on January 1 and July 1, 1943, and $17,000 on January 1 and July 1, in each year thereafter to and including July 1, 1952. The proceeds will be used as a part of the purchase price of new equipment costing a total of $380,000 and consisting of 100 all-steel hopper cars and two 660-hp. Diesel-electric switching locomotives.

Supply Trade Notes

THE DEVILBISS COMPANY has moved its St. Louis, Mo., sales and service branch to 2737 Washington avenue.

◆

THE BURGESS BATTERY COMPANY has announced a change of address of its acoustic division to 2815 West Roscoe street, Chicago.

◆

SYMINGTON-GOULD CORPORATION. — The following changes have been made in titles in the engineering department of the Symington-Gould Corporation: At Rochester, N. Y.—*C. I. Lusink*, chief mechanical engineer; *C. P. Noser*, assistant to chief mechanical engineer; *E. R. Oeschger*, mechanical engineer, and *E. J. Warnock*, chief draftsman. At Depew, N. Y.—*R. E. Blakely*, resident engineer; *C. I. Smith*, chief draftsman, and *W. C. Weaver*, assistant works engineer. Mr. Lusink was formerly mechanical engineer.

◆

CAMEL SALES COMPANY.—*Leo F. Duffy*, assistant vice-president of the Camel Sales Company, Chicago, has been appointed vice-president; *Leo C. Voss*, assistant treasurer, has been promoted to the position of assistant vice-president; and *Earl C. Browne* has been appointed assistant vice-president.

◆

PITTSBURGH PLATE GLASS COMPANY.—*R. B. Tucker*, director of the glass sales of the Pittsburgh Plate Glass Company, has been elected to the board of directors, succeeding *H. A. Galt*, who is retiring after more than 40 years of continuous service.

◆

D. J. WILLIAMS, western railroad sales manager of the Air Reduction Sales Company, with headquarters at San Francisco, Calif., has entered the services of the U. S. Navy as lieutenant commander, and will be located in the Ninth Naval District, working with the Office of Material Procurement.

◆

PAUL KELLER, manager of the Cleveland, Ohio, sales district of the Copperweld Steel Company, has been appointed manager of tool, stainless, and special steel sales, with headquarters at Warren, Ohio.

◆

UNITED STATES STEEL CORP.—*John J. Davis, Jr.*, assistant manager of sales at Chicago of the Railroad Materials and Commercial Forgings division of the United States Steel Corporation, will have charge of that division during the absence of *Orrin H. Baker*, manager of the division, who is serving with the War Production Board at Washington, D. C.

◆

PULLMAN-STANDARD CAR MANUFACTURING COMPANY.—*T. P. Gorter*, sales agent of the Pullman-Standard Car Manufacturing Company, with headquarters at Washington, and *J. W. Scallan*, manager of sales of the Western district, with headquarters at Chicago, have been appointed assistant vice-presidents with headquarters at Washington.

◆

THE GISHOLT MACHINE COMPANY, Madison, Wis., manufacturers of turret and automatic lathes and static and dynamic balancing machines, has expanded its facilities for the manufacture of turret lathes by approximately 50,000 sq. ft. by the addition of a new one-story building at its Northern Works.

◆

E. P. BULLARD, JR., president of the Bullard Company of Bridgeport, Conn., and inventor of the Bullard vertical turret lathe, the mult-au-matic and the contin-u-matic, on March 10 marked the 50th year of his active participation in the firm founded in 1880 by his father.

The company's output of machine tools is now entirely for defense, carrying out a tradition started when Mr. Bullard's father was recalled from the Northern army in the Civil War to make pistols at the Colt plant in Hartford, Conn., and continued when Mr. Bullard turned out machine tools and 155 mm guns for the allied powers in World War I. When Mr. Bullard was graduated from Amherst College and completed his apprenticeship under his father, the company had 55 employees. There are now 5,000 employees built around a large nucleus of men trained under an apprenticeship program maintained throughout the depression years. Eighteen associates, whose service totaled 786 years, greeted Mr. Bullard on his golden anniversary as an industrialist.

◆

EDGEWATER STEEL COMPANY.—*F. B. Bell*, who has been president of the Edgewater Steel Company since its organization 25 years ago, has been elected chairman of the board of directors. Mr. Bell has been devoting most of his time to his work in the War Production Board and asked that he be relieved of the detailed duties of president. *D. S. Bell* was chosen as president of the company and J. H. Baily, D. W. McGeorge, and W. F. Carey reappointed to the offices of vice-president, secretary and treasurer, respectively. *M. A. Smith* was elected to the new office of vice-president and general manager and *J. F. Manns* as assistant secretary. D. S. Bell and W. F. Carey were also elected directors of the company.

(Continued on next left-hand page)

EDWARDS COMPANY.—*Ralph B. Rogers,* president of the Edwards Company, manufacturers of self-propelled railway passenger motor cars, will head, as president, the new management of the Hill Diesel

Ralph B. Rogers

Engine Company, which has been purchased by the Edwards Company. *R. E. Olds* will remain as chairman of the board of directors. Due to the demands for increased production created by the war, an extensive program of modernization and enlargement of manufacturing facilities of the Hill Company has been started.

◆

PULLMAN COMPANY.—*G. M. Williams,* assistant mechanical superintendent of the Pullman Company, with headquarters at Chicago, has retired, and *E. L. Goodwin,* assistant to the mechanical superintendent at Chicago, and *John Cannon,* manager of the Wilmington (Del.) shop, have been promoted to senior and junior assistant mechanical superintendents, respectively, with headquarters at Chicago, succeeding Mr. Williams.

Mr. Goodwin entered the service of the Pullman Company at its Denver (Colo.) repair shop in 1905 and was later transferred to Richmond, Calif. In December, 1919, he was appointed mechanical inspector at Chicago, and on January 1, 1923, became assistant to the mechanical superintendent.

Mr. Cannon entered the service of the Pullman Company on April 15, 1912, at its Wilmington shop and all of his service has been at that point. He was promoted successively through various positions, becoming manager on February 1, 1942.

◆

RALPH KELLY, vice-president in charge of sales for the Westinghouse Electric & Manufacturing Co. since 1938, has been elected executive vice-president and a director of the Baldwin Locomotive Works. Mr. Kelly graduated from Harvard University in 1909 and that year began his association with Westinghouse as an apprentice in its power engineering department. He served as a lieutenant in the United States Navy during the first world war and in 1920 rejoined Westinghouse in its marine engineering division, subsequently becoming the engineering manager of the company's southwestern district, with headquarters at St. Louis, Mo. He advanced to manager of that district and later to manager of the central district with headquarters at Pittsburgh, Pa. In 1934, Mr. Kelly was appointed vice-president in charge of the operating division of Westinghouse centered around east Pittsburgh, Pa., and in 1938 he became vice-president in charge of sales. Mr. Kelly is a director of the Canadian Westinghouse Company, Ltd., as well as of a number of Westinghouse affiliates, including Bryant Electric Company and Westinghouse Electric International Company. His membership includes the National Electrical Manufacturers Association, of which he is a vice-president and a member of the Board of Governors, and the American Iron & Steel Institute.

◆

THE INDEPENDENT PNEUMATIC TOOL COMPANY has moved its Detroit branch to its own new building at 15605 Woodrow Wilson avenue. Other new branch offices and service stations have recently been opened at Philadelphia and San Francisco. Additions have also been made to Thor factory facilities at Los Angeles, Calif., and Aurora, Ill.

◆

THE WAUGH LABORATORIES of New York, a division of the Waugh Equipment Company, has opened a Pacific coast branch with offices in the Petroleum building, 714 Olympic boulevard, Los Angeles, Calif. *Emmett M. Irwin* has been placed in charge. Mr. Irwin, a graduate of the California Institute of Technology, has been engaged for many years as a consulting engineer in Los Angeles. He acted in this capacity on the wind tunnel at Akron, Ohio; was consulting and construction engineer on the Diesel-electric power plant at Crescent City, Calif., and was as-

Emmett M. Irwin

sistant consulting engineer for the Imperial irrigation district in connection with the power project for the all American canal. He was also engineer in charge of design for the pump testing laboratory of the metropolitan water district of southern California, chief electrical engineer in charge of design and construction of all controls and drives for the 200-in. telescope being constructed at Palomar Mt., Calif., and chief engineer for the Magnatest Corporation of Long Beach, Calif., developing a magnetic testing system for use in connection with the fatigue of metals.

SCULLY STEEL PRODUCTS CO.—*E. E. Aldous* has been elected president and a director, *L. B. Worthington* vice-president and a director, and *Charles B. Vernooy* comptroller, secretary and a director of the *Scully Steel Products Company,* a subsidiary of the United States Steel Corporation. Mr. Aldous was previously manager of sales for United States Steel Corporation subsidiaries at Houston, Tex. Mr. Worthington had been manager of sales, bar, strip and semi-finished materials of the Carnegie-Illinois Steel Corporation at Pittsburgh, Pa. Mr. Vernooy had been staff assistant of the procedure section of the American Steel & Wire Co. at Cleveland, Ohio.

Mr. Aldous began his service with United States Steel Corporation subsidiaries in 1901 in the Denver, Colo., office

E. E. Aldous

of American Steel & Wire Co. He served in a sales capacity, at different times covering the entire inter-mountain territory. In 1921 he was transferred to St. Paul, Minn., as manager of sales of the St. Paul office, of the American Steel & Wire Co., and was transferred in 1929 to Chicago as manager of sales, fence and post department. Mr. Aldous was promoted to manager of sales for United States Steel Corporation subsidiaries at Houston, in 1933, which position he held until his recent promotion.

◆

AMERICAN CAR AND FOUNDRY COMPANY.—*J. L. Mahon* has been appointed district manager and *Robert Clade* works manager of the valve division of the American Car and Foundry Company at Detroit, Mich. Mr. Mahon was formerly superintendent of foundries. *P. H. Sullivan,* formerly assistant district manager in Detroit, has been retired at his own request.

◆

JONES & LAUGHLIN STEEL CORP.—*C. M. Mason,* district sales manager in Buffalo, N. Y., for the Jones & Laughlin Steel Corporation, has been appointed district sales manager with headquarters at Cleveland, Ohio, succeeding *E. A. France,* who retired after 37 years of service with the company. *E. H. Hughes,* formerly district sales manager at St. Louis, Mo., will succeed Mr. Mason at Buffalo. *L. S. Berkey,* formerly resident manager of

sales in Toledo, Ohio, has been appointed district manager at St. Louis, and *E. S. Lewis,* of the company's general sales office in Pittsburgh, Pa., has been appointed resident manager at Toledo. *P. B. Turner,* special representative in the New York office, has been appointed manager of export sales, with *W. R. Spindler,* assistant manager.

◆

CATERPILLAR TRACTOR COMPANY.—*Harmon S. Eberhard* has been elected a vice-president of the Caterpillar Tractor Company, Peoria, Ill., succeeding *Thomas John O'Connor,* deceased. *C. G. A. Rosen* has been appointed director of a newly created research department. *G. E. Burks* has been promoted to the position of chief engineer.

Mr. Eberhard was born at Stockton, Calif., and entered the employ of the Holt Manufacturing Company there at the age of sixteen, serving as a draftsman in the

Harmon S. Eberhard

engineering department. He enlisted as a private in the Corps of Engineers in World War I and was discharged with the rank of sergeant after spending more than a year overseas. Upon his return to Stockton, Mr. Eberhard was assigned to special development work for the U. S. Ordnance Department on self-propelled track-type gun mounts suited for high speed travel. From 1920 to 1925 he designed commercial products for the Holt Manufacturing Company and in 1925 went with the engineering staff of the Caterpillar Tractor Company at San Leandro, Calif. In 1928 he was advanced to assistant general chief engineer and in 1930 to chief engineer in charge of research. Mr. Eberhard was transferred to Peoria as chief engineer in 1933, which position he held until his recent promotion. Mr. Eberhard now has administrative direction of research, engineering, manufacturing, industrial relations and training.

Mr. Burks was born in Montana and attended the University of Montana for one year. He then moved to California, where he acquired his early engineering experience, continuing his studies through extension courses of the University of California. His first experience in the design of heavy machinery was with the Schmeiser Manufacturing Company, Davis, Calif. In 1928 he joined the engineering staff of the Western Harvester Company, Stockton, Calif. (then a subsidiary of the Caterpillar Tractor Company), and a year later was transferred to the Caterpillar company's engineering offices at San Leandro, Calif. In 1933 he was advanced from chief draftsman to supervision of experimental and re-

G. E. Burks

search engineering at San Leandro, and in 1938 he was promoted to assistant chief engineer in charge of engine design, with headquarters at Peoria.

◆

AMERICAN LOCOMOTIVE CO.—*W. E. Corrigan,* vice-president of the American Locomotive Company in charge of munitions and miscellaneous sales, has assumed additional duties as head of Diesel engine sales. Diesel locomotive sales remain under the supervision of *Perry T. Egbert.* Mr. Corrigan, who was a captain in the artillery ordnance branch of the United States Army during the last war, has participated in the negotiation of various recent government contracts with the American Locomotive Company for the production of ordnance and other war materials. He started with the company in 1909, completed a four-year course in locomotive construction at its Schenectady, N. Y., plant, and since has served in various engineering sales capacities. He was elected vice-president in 1936.

◆

EDWIN H. BROWN, has been elected vice-president of the Allis-Chalmers Manufacturing Company in charge of engineering and development. Mr. Brown graduated from the University of Nebraska in 1906 and immediately thereafter entered the Allis-Chalmers course of training for graduate engineers. Upon completion of the two-year engineer apprentice course, he served in various capacities with the company, and then became assistant manager of the steam-turbine department. In 1935 he was promoted to manager and chief engineer of the engine and condenser department, which position he occupied at the time of election to the vice-presidency.

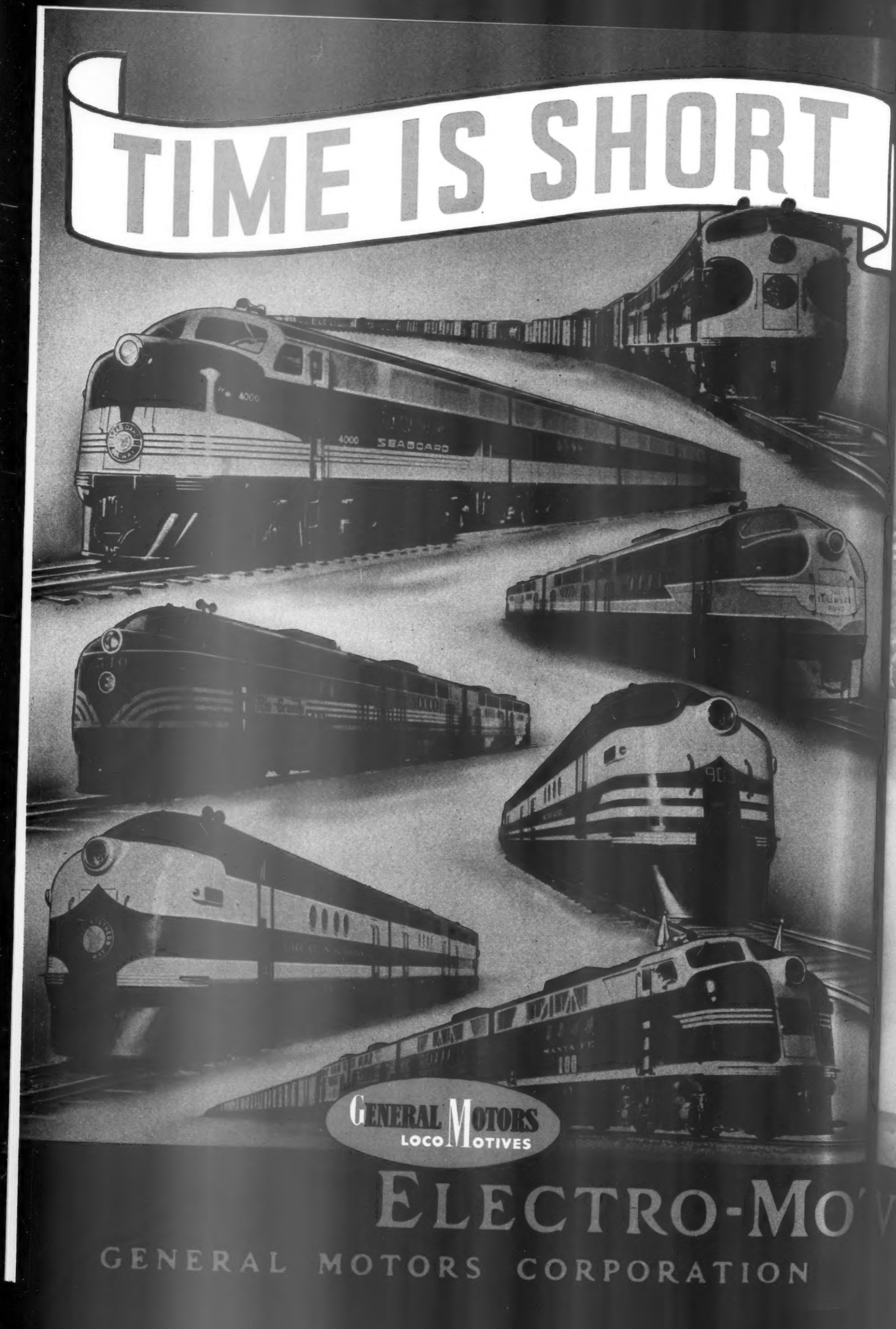
Obituary

WILLIAM E. WOODARD, vice-president in charge of design, and a director of the Lima Locomotive Works, Inc., died at his home, Forest Hills, L. I., on Tuesday, March 24, after an extended illness due to a heart ailment. He was also consulting engineer of the Franklin Railway Supply Company, Inc. Mr. Woodard was born in Utica, N. Y., on November 18, 1873. He attended the Utica high school and Cornell University, where he received the degree of mechanical engineer in 1896. During his career he was connected with The Baldwin Locomotive Works, Cramp Shipyard, the Dickson Locomotive Works, the Schenectady Locomotive Works, and the American Locomotive Company. His service with the Schenectady Locomotive Works, later to be merged in the American Locomotive Company, began in 1900. With the latter company he served successively as chief draftsman, manager of the electric locomotive and truck department, and assistant mechanical engineer until 1916. He was then elected vice-president of the Lima Locomotive Works, in charge of engineering. In 1925 Mr. Woodard designed the Lima A-1 locomotive, with 2-8-4 wheel arrangement, which is a prototype of the modern steam locomotive combining high speed with high horsepower capacity. It was largely through his work, first embodied in a 2-8-2 type, the Michigan Central No. 8000 built in 1922, and culminating in the A-1 design, that the horsepower has superseded the tractive-force-pound as the unit in terms of which steam locomotive capacity is customarily measured. In 1939 he introduced a new design of valve gear for poppet-valve loco-

W. E. Woodard

motives. Mr. Woodard was the author of various papers on locomotive subjects and had been granted over 100 United States patents on improvements in locomotive and car construction. His principal inventions consisted of lightweight car trucks, height adjuster for subway cars, constant-resistance engine and trailer trucks for locomotives, locomotive throttle and throttle operating mechanism, tandem main-rod drive for locomotives, locomotive steam pipe and superheater header arrangement, articulated four-wheel trailer truck for locomotives, locomotive valve gear and poppet-valve cylinders, and a force-feed circulation boiler for locomotives. He was designated a "Modern Pioneer" by the National Association of Manufacturers in 1940, and in the same year was awarded the George R. Henderson Medal by The Franklin In-

(*Continued on second left-hand page*)


TIME IS SHORT
4000
SEABOARD
GENERAL MOTORS
LOCOMOTIVES
ELECTRO-MO
GENERAL MOTORS CORPORATION

DIESELS ARE FAST

IN America's Victory Program, the railroads rank in importance with the Army, Navy and Air Corps, and of all the indispensable parts of the war effort, transportation is the most far reaching. It enters every stage of production from the time raw materials leave the ground until the finished products reach their final destination. Troops, planes, ships, tanks, guns, shells, bombs, as well as that great army of workers in war production plants, would all be useless without transportation.

This is no time to waste time, and fortunate are the railroads using General Motors Diesel locomotives, for in them lie the advantages which are so vitally important at this time.

GM Diesel Freight Locomotives make possible: — reduction in train miles as much as 50 per cent — faster schedules with fewer service delays — increased tonnage hauling capacity — and for each Diesel operated release as many as five steam locomotives for other important services. And as more Diesels go into service, America's transportation network becomes that much stronger.

WHO SERVES THE RAILROADS – SERVES AMERICA

O'VE DIVISION

LA GRANGE, ILLINOIS, U. S. A.

stitute, Philadelphia, Pa., in consideration of his accomplishments in locomotive engineering and his important contributions to the field of steam locomotive design. Mr. Woodard was a member of the American Society of Mechanical Engineers, the American Society for Testing Materials, the American Railway Engineering Association, and an associate member of the Mechanical Division of the Association of American Railroads. He was a member of the Mechanical Division Committee on Further Development of the Reciprocating Steam Locomotive and also a member of the Builders' Subcommittee of the Committee on Locomotive Construction.

◆

JAMES HARVEY WILLIAMS, president of J. H. Williams & Co. of New York and Buffalo, N. Y., died in New York on February 23. Mr. Williams, who was born in Brooklyn, N. Y., on March 22, 1882, was the elder son of James H. Williams, founder of J. H. Williams & Co. Following the death of his father in 1904, Mr. Williams became vice-president of J. H. Williams & Co. and, in 1916, president. In 1923, when the Brooklyn plant was closed and its facilities consolidated with the present Buffalo works, Mr. Williams moved to Buffalo. He returned to New York in 1933 at the time the company's general offices were established in New York. Mr. Williams received his B.A. degree at Yale. He was a founder of the American Drop Forging Institute and was at one time president of the American Supply and Machinery Manufacturers' Association.

J. H. Williams

◆

GEORGE E. HOWARD, formerly vice-president and sales manager of the Commonwealth Steel Company, who retired in 1930, shortly after that company was merged with the General Steel Castings Corporation, Eddystone, Pa., died at St. Louis, Mo., on February 4. Mr. Howard was born at Wapella, Ill., on January 20, 1858, and worked from 1872 until 1884 as a machinist, locomotive fireman and engineer on the Union Pacific. His locomotive was No. 57 and this number became a hobby with him throughout the remainder of his life. He always obtained it on whatever he acquired which had a numerical reference. In 1884 he entered the hardware and agricultural implement business at Wood River, Neb., and in 1890 became superintendent of the Scarritt Car Seat Works at St. Louis. In 1906, Mr. Howard went with the Commonwealth Steel Company as vice-president and sales manager. After the merger of this company with the General Steel Castings Corporation in 1929, he stayed on for a few months in an advisory capacity before retiring from active business.

◆

A. CHRISTIANSON, assistant to the president of the O. C. Duryea Corporation, New York, died in a sanitarium at Battle Creek, Mich., on March 5. Formerly, he was chief engineer of the Standard Steel Car Company and from July 1, 1933, until April, 1941, when he joined the Duryea Corporation, was chief engineer of the Pullman-Standard Car Mfg. Co.

◆

JOHN F. PRATT, vice-president of the Brake Equipment & Supply Co., of Chicago, died February 28 at his home in Riverside, Ill. Mr. Pratt was connected with the Grand Trunk Railway from 1888 to 1900 and with the Great Northern Railway from 1900 to 1920. He was general storekeeper for this latter road from September, 1916, to April, 1920. From April, 1920, to July, 1925, he was general storekeeper and local purchasing agent for the Cuba Railroad, Camaquey, Cuba. He joined the Brake Equipment & Supply Co. in 1925.

◆

EDWARD T. FISHWICK, senior vice-president and a director of the Worthington Pump & Machinery Corporation, died March 15 at his home in Glen Ridge, N. J. Mr. Fishwick had been with the Worthington organization for 49 years. He originally started with the corporation at its Cincinnati, Ohio, works. He was also president and a director of the Worthington-Gamon Meter Company of Newark, N. J.; a director of the Glen Ridge Trust Company; a director of the New Jersey State Chamber of Commerce; and was formerly head of the Diesel Engine Manufacturers' Association.

◆

CHRISTIAN DAVIDSON, SR., a former vice-president of the Ryan Car Company, Chicago (no longer in existence) died on February 21 at his home in Chicago.

◆

FRANK J. BOATRIGHT, railway department representative in New England for the Dearborn Chemical Company died February 17.

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JOHN M. LAMMADEE, mechanical engineer for the Wilson Engineering Company, Chicago, and at one time a mechanical editor for the Railway Review, died suddenly of a heart attack at his office on February 21.

◆

HENRY M. LUCAS, founder and president of the Lucas Machine Tool Company, Cleveland, Ohio, died in that city on March 2. He was born in Cleveland, Ohio, on February 25, 1869, and served his apprenticeship as a machinist with the Warner & Swasey Co., which he joined in 1886. Later he became a department foreman and soon after was placed in the engineering department. He became chief draftsman in 1895 and in 1899 left this company to organize the Lucas Machine Tool Co.

Henry M. Lucas

Personal Mention

General

OTTO C. GRUENBERG, superintendent motive power of the New York, Ontario & Western at Middletown, N. Y., has been granted a leave of absence for the war's duration for service with the United States Army.

E. R. BUCK, superintendent of motive power of the Wabash and the Ann Arbor, with headquarters at Decatur, Ill., has had his title changed to general superintendent of motive power.

A. W. BYRON has been appointed superintendent of motive power of the Eastern and Central Pennsylvania divisions of the Pennsylvania.

F. C. WAGER, master mechanic of the Spokane, Portland & Seattle at Vancouver, Wash., has had his title changed to mechanical superintendent.

A. D. WILLIAMS, superintendent of motive power of the Southern Pacific at Sacramento, Calif., retired from active service on March 1.

E. E. HINCHMAN, superintendent of the Los Angeles (Calif.) general shops of the Southern Pacific, has been appointed assistant superintendent of motive power at Sacramento.

(Continued on next left-hand page)

HELP for *Mechanical Departments* In Meeting Today's Challenge

No. 8ET Brake Equipment

Unique operating characteristics provide easy manipulation and distinctively flexible control. Enginemen can therefore readily handle trains with remarkable smoothness to adequately safeguard cars and lading. Superior structural features assure continuing reliable performance. Leading railroads now apply this equipment to all new locomotives, and convert many others—so notably has it helped to increase motive power serviceability.

G Suction Filter and F-1-A Lubricator

Thoroughly cleaned intake air and the right amount of lubricant supplied regularly to air compressors serve to materially extend their service life. Many railroads by using these devices, now realize consistently reliable performance throughout the period between locomotive shoppings. Others have entirely eliminated laundering operations. Such reduction in maintenance requirements helps to increase locomotive availability.

AB Brake Equipment

A help in attaining maximum potential utility of freight cars. Smoother control of train slack, made possible by improved functions, protects car structures and appliances from damage, thus minimizing up-keep requirements. Inherent self-protecting features preserve functional integrity, and reduce frequency of brake maintenance. This two-fold advantage is becoming more outstandingly evident with the increasing percentage of cars so equipped.

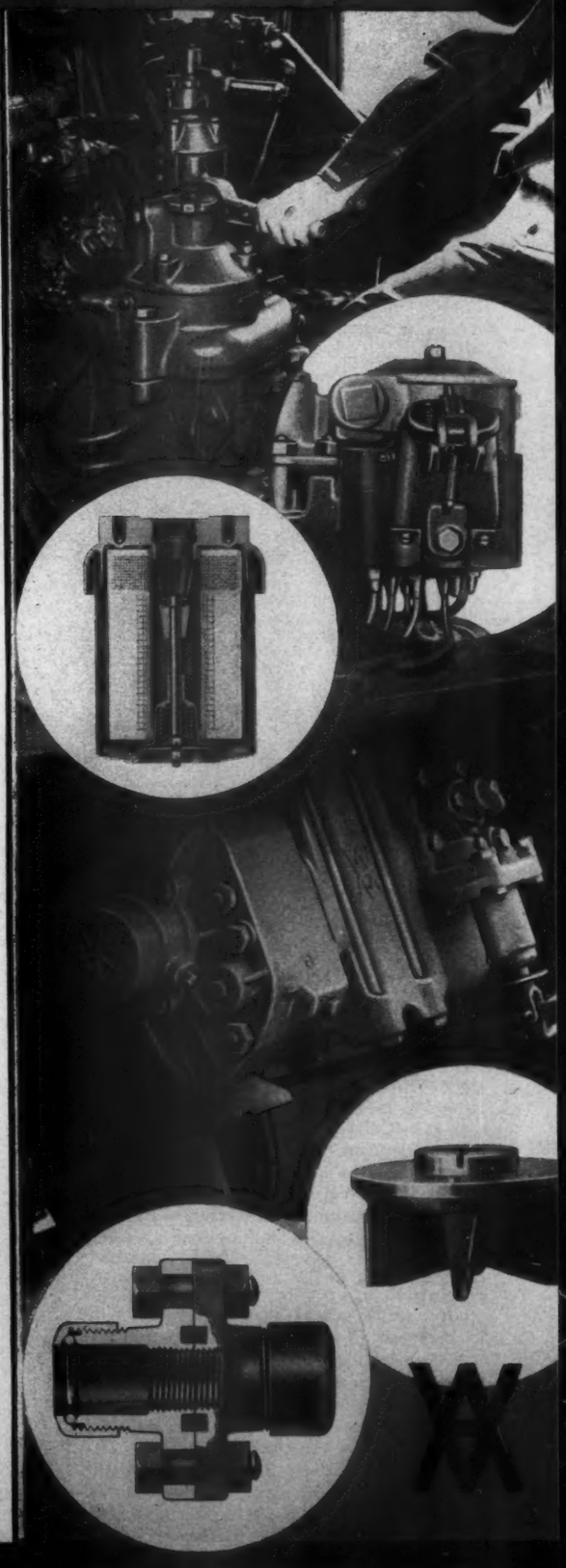
Wabcotite Fittings

For every joint in any air brake equipment, where pipes unite, or branch, or attach to a device, there are suitable Wabcotite Fittings —tees, elbows, flanges, unions—available in a complete range of types and sizes. Among the thousands of these fittings now in service, none has been known to break, leak, or require maintenance.

"Genuine" Repair Parts

When repairs on air brake apparatus become necessary it is a fundamentally sound practice to use only genuine replacement parts—exact duplicates of details they displace. Men responsible for keeping vital equipment up to par in performance can thus do a first class maintenance job easier and quicker—no additional machining or fitting is needed.

Mechanical department personnel, in their efforts to secure the maximum serviceability of Air Brake equipment, can at any time desired, have the counsel and assistance of our representatives.



WESTINGHOUSE AIR BRAKE CO.

WILMERDING, PENNSYLVANIA

A. C. HOWARD has been appointed assistant mechanical engineer of the Pere Marquette, with headquarters at Detroit, Mich.

A. B. WILSON, assistant superintendent of motive power on the Southern Pacific at Sacramento, Calif., has been appointed superintendent of motive power, with the same headquarters.

WALTER O. NUGENT, superintendent of the locomotive shops of the Canadian National at Transcona, Man., has been appointed assistant general superintendent of motive power and equipment, Western region, with headquarters at Winnipeg, Man.

R. F. WEISS, assistant to the vice-president, research and mechanical standards of the Union Pacific at Omaha, Neb., has been appointed superintendent of motive power and machinery of the Eastern district. Mr. Weiss entered railway service in 1913 as a messenger on the Union Pa-

R. F. Weiss

cific at Green River, Wyo. In 1918 he became a machinist apprentice at Cheyenne, Wyo., and in 1919 a machinist, later serving as enginehouse foreman and district foreman at North Platte, Neb. In 1936 he was promoted to assistant master mechanic at Cheyenne and less than a year later became master mechanic at Green River, later being transferred to Cheyenne. During the year 1939, he served, successively, as a special representative at Omaha, shop superintendent at Cheyenne, and master mechanic at Pocatello, Idaho. Early this year, Mr. Weiss was appointed to the temporary position of assistant to the vice-president, research and mechanical standards.

JAMES J. THOMPSON, special representative in the general manager's office of the Tennessee Central, has been promoted to mechanical assistant to the president, with headquarters as before at Nashville, Tenn. Mr. Thompson was born at Roanoke, Va., on September 7, 1906, and attended Virginia Military Institute, Lexington, Va. He entered railway service in February, 1925, as a messenger in the statistical bureau of the Norfolk & Western at Roanoke, Va., transferring to the mechanical department a month later as a helper machinist in the erecting shop. He later returned to school but served subsequently between school terms and then regularly in the Roanoke shops, at Pittsburgh, Pa., Bluefield, W. Va., and the Shaffers Crossing roundhouse as special apprentice, material inspector and shop inspector. On September 1, 1937, Mr. Thompson was

James J. Thompson

transferred to the operating department as an assistant road foreman of engines at Roanoke, later being transferred to Crewe, Va., and then being promoted to assistant trainmaster, in which capacity he served on the Radford, Pocahontas and Shenandoah divisions. On November 30, 1941, Mr. Thompson resigned to go with the Tennessee Central as a special representative in the general manager's office.

JOHN GOGERTY, superintendent of motive power and machinery of the Eastern district of the Union Pacific, has been appointed general superintendent of motive power and machinery, with headquarters as before at Omaha, Neb. Mr. Gogerty entered Union Pacific service in 1918 as an enginehouse foreman at Armstrong, Wash., and then served as general foreman and district foreman at various points on the western part of the Union Pacific system until 1925, when he was promoted to the

John Gogerty

position of master mechanic at Green River, Wyo. In 1928 he was transferred to Cheyenne, Wyo., and in 1933 was appointed superintendent of shops at Omaha. In 1936 Mr. Gogerty became acting assistant general superintendent of motive power and machinery, with headquarters at Cheyenne; in 1937, assistant general superintendent of motive power and machinery at Cheyenne, and on April 1, 1940, superintendent of motive power and machinery, Eastern district, with headquarters at Omaha.

CHARLES M. BOWLING, assistant trainmaster on the Louisville & Nashville at Latonia, Ky., has been promoted to superintendent of safety, with headquarters at Louisville, Ky., succeeding Earle G. Evans, deceased. Mr. Bowling was born at Longdale, Va., and entered railway service on November 7, 1901, as a locomotive fireman on the L. & N. at Covington, Ky. He later served as locomotive engineer, as assistant trainmaster at Paris, Ky., and as inspector of safety at Birmingham, Ala.,

Charles M. Bowling

Corbin, Ky., and Paris, Ky. On June 16, 1941, he was appointed assistant trainmaster at Latonia.

Master Mechanics and Road Foremen

W. F. LAUER, master mechanic of the Illinois Central at Memphis, Tenn., retired from active service on March 1.

E. L. FRAZIER, JR., has been appointed master mechanic of the Pittsburg & Shawmut, with headquarters at Brookville, Pa.

J. A. CRUNK has been appointed master mechanic of the Tennessee Central, with headquarters at Nashville, Tenn.

H. B. PAYNE, general foreman on the Norfolk & Western at Portsmouth, Ohio, has been appointed general master mechanic at Roanoke, Va.

PAUL THOMAS, master mechanic of the Pennsylvania at Chicago, has been transferred to Pittsburgh, Pa.

JOHN C. GUNNING, enginehouse foreman on the Union Pacific at Ogden, Utah, has been promoted to the position of master mechanic at Salt Lake City, Utah.

G. S. WEBB, assistant master mechanic of the Pennsylvania at Columbus, Ohio, has been appointed master mechanic with headquarters at Chicago.

H. J. KLEINE, master mechanic of the Pan Handle division of the Pennsylvania at Pittsburgh, Pa., has been promoted to the position of master mechanic of the

Western Pennsylvania General division, with headquarters at Pitcairn, Pa.

M. H. Losch, who has been appointed master mechanic of the Illinois and Missouri divisions and the Dupo terminals of the Missouri Pacific and of the Missouri-Illinois with headquarters at Dupo, Ill., as announced in the February, *Railway Mechanical Engineer*, was born on March 28,

M. H. Losch

1893, at DeSoto, Mo. He attended grade and high schools from 1900 to 1911, and entered the service of the Missouri Pacific on September 11, 1911, as a machinist apprentice. In September, 1916, he became a machinist at Poplar Bluff, Mo., and in October, 1917, was transferred to St. Louis, Mo. From February, 1918, to July 1, 1922, he was a machinist in the employ of the Commonwealth Steel Co., Granite City, Ill. In May, 1923, he returned to the Missouri Pacific as a machinist at St. Louis, Mo. In July, 1923, he became night enginehouse foreman at St. Louis; in January, 1924, day enginehouse foreman; on December 1, 1927, general foreman, and on January 1, 1942, master mechanic at Dupo.

Shop and Enginehouse

James Bean has been appointed superintendent of the Los Angeles (Calif.) general shops of the Southern Pacific.

R. W. Mather has been appointed assistant foreman in the machine shop of the Canadian National at Moncton, N. B.

L. M. Campion has been appointed day enginehouse foreman of the Chicago & North Western, with headquarters at Ashland, Wis.

D. E. Mackinnon, general foreman on the Canadian National at Edmonton, Alta., has been appointed superintendent of the locomotive shops at Transcona, Man.

Walter S. Hunter has been appointed to assistant foreman in the erecting shop of the Canadian National, with headquarters at Moncton, N. B.

J. C. Miller, general and erecting foreman on the New York, Chicago & St. Louis at Conneaut, Ohio, has been appointed superintendent of shops, with headquarters at Conneaut, as announced in the March issue of the *Railway Mechanical Engineer*. Mr. Miller was born on April 7, 1883, at Hubbard, Ohio. He attended high school for two years and some years later (in 1926) completed an industrial engineering course at State College, State College, Pa. He began railway service in March, 1905, with the Bessemer & Lake Erie as a boilermaker helper, and in August, 1906, became a machinist helper. On October 10, 1910, he entered the employ of the New York, Chicago & St. Louis as a machinist. He was assigned to inspect locomotives being built for the Nickel Plate by the Lima Locomotive Company in February, 1917, and, in November of the same year, became pit foreman at the Con-

J. C. Miller

neaut locomotive shop. In February, 1919, he was promoted to general foreman of the locomotive backshops at Conneaut, and in February, 1923, became shop superintendent. In December, 1931, the position of shop superintendent was abolished, and Mr. Miller became general and erecting foreman of the locomotive department. In 1941, he was president of the Locomotive Maintenance Officers' Association.

Car Department

G. E. Collins, assistant superintendent of the passenger-car shops of the Chicago & North Western at Chicago, has retired.

W. Barrer has been appointed general car foreman of the California Avenue coach yard of the Chicago & North Western at Chicago.

G. R. Andersen, district supervisor car maintenance of the Chicago & North Western at Chicago, has been appointed assistant superintendent car department, succeeding E. P. Marsh, deceased.

C. P. Nelson, general car foreman of the Chicago & North Western at Chicago, has been appointed assistant superintendent of the passenger-car shops at Chicago.

J. C. Byrne has been appointed district supervisor of car maintenance of the Chicago & North Western, with headquarters at Chicago. The position of supervisor of car maintenance held by Mr. Byrne at Green Bay, Wis., has been abolished.

W. R. Hall, supervisor of car maintenance of the Western district of the Chicago & North Western at Boone, Iowa, has been transferred to the position of supervisor of car maintenance at Chicago, and his duties have been extended to cover the system.

Purchasing and Stores

William A. Summerhays, who has been on leave of absence from the Illinois Central, serving at Washington, D. C., as a consultant to the Office of Production Management, has been appointed assistant to the vice-president, purchases and stores, with headquarters at Chicago.

Obituary

William F. Wright, purchasing agent of the Louisiana & Arkansas, with headquarters at Minden, La., died at his home at Shreveport, La., on February 19 after a short illness.

William R. Culver, superintendent of stores of the Chesapeake & Ohio, the Nickel Plate and the Pere Marquette, with headquarters at Cleveland, Ohio, died suddenly while on a train en route from Grand Rapids, Mich.

John A. Burke, supervisor of air brakes of the Atchison, Topeka & Santa Fe system, with headquarters at Topeka, Kan., died suddenly at Ft. Wayne, Ind., on February 6. Mr. Burke was active in the Air Brake Association and was a member of the executive committee of that association in 1937. He was a vice-president of the Railway Fuel and Traveling Engineers' Association at the time of his death.

Geary E. Carson, who retired as district master car builder of the New York Central at West Albany, N. Y., on June 1, 1925, died on March 19. Mr. Carson was born on January 15, 1864, at Delmont, Pa. He entered railway service with the Pittsburgh & Lake Erie on October 1, 1890, and became district master car builder of the New York Central on September 1, 1908.

Trade Publications

Copies of trade publications described in the column can be obtained by writing to the manufacturers, preferably on company letterhead, giving title. State the name and number of the bulletin or catalog desired, when it is mentioned.

"Your Share of a Million Dollars."—The American Brake Shoe and Foundry Company, Brake Shoe and Castings Division, 230 Park avenue, New York. A 17½-in. by 14-in. book on brake-shoe research. Illustrations in color.

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"General American Transportation—What It Is; What It Does."—General American Transportation Corporation, 135 South La Salle street, Chicago. Thirty-two page booklet, 9¾ in. by 12¾ in., in two colors. Explains and illustrates in detail each of the company's enterprises—The G. A. T. X. fleet; freight-car building; plate and welding division; tank storage terminals; motorcoach manufacture, and precooling division.


"BEST LOCOMOT
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